













LITTLE MASTERPIECES OF SCIENCE







*Christopher Columbus.*

# Little Masterpieces of Science

Edited by George Iles

## EXPLORERS

|                      |                    |
|----------------------|--------------------|
| Christopher Columbus | Charles Wilkes     |
| Lewis and Clarke     | Clarence King      |
| Zebulon M. Pike      | John Wesley Powell |



NEW YORK  
DOUBLEDAY, PAGE & COMPANY  
1902

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## PREFACE

"Peace hath her victories  
No less renown'd than war."

THE love of adventure, the expectation of the unexpected, have ever prompted men stout of heart, and ready of resource, to brave the perils of wilderness and sea that they might set their feet where man never trod before. The world owes much to the explorers who have faced hostile savages, stood in jeopardy from the cobra and the lion, the foes as deadly which lurk in the brook which quenches thirst. A traveller like Clarke takes his life in his hands. He breaks a path which leads he knows not whither: it may bring him to a shore whence he has no ship to sail from; it may end in an abyss he cannot bridge. The thickets rend and sting him, poison may colour a tempting grain or berry, frost may deaden his energies and lull him to the sleep that knows no waking. He has but little aid from science: beyond food and medicine he carries little more than a watch, a compass, a rifle, and a cartridge belt. Beyond all instruments and weapons are his skill, agility, gumption, diplomacy. And these resources in no mean measure are shared by the man for whom he prepares the way, the immigrant, who, in the early days of settlement, requires a constancy

## Preface

even higher than the explorer's own. It is one thing to traverse a wilderness under the excitement of hourly adventure; it is another thing to stay there for a lifetime and convert it to a home.

The race of American explorers is not extinct. Major Powell is with us to-day, hale and hearty still. Peary, in the prime of his powers, is as capital an example of courage and resource as ever threw themselves upon the riddle of the frozen north. Beyond the Arctic and Antarctic circles little remains unknown on earth. When at last every rood of ground and knot of sea is mapped and charted, whither shall the explorer direct his steps? He cannot repeat the conquests of Lewis and Clarke, Pike and Peary, but he need not on that account fold his hands so long as a brave heart and a quick wit are wanted in the world.

GEORGE ILES

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## COLUMBUS DISCOVERS AMERICA

JUSTIN WINSOR

[Part of Chapter IX., "The Final Agreement and the First Voyage" from "Christopher Columbus and How He Received and Imparted the Spirit of Discovery," copyright by Houghton, Mifflin & Co., Boston and New York, 1892.]

So, everything being ready, on the 3rd of August, 1492, a half-hour before sunrise, he unmoored his little fleet in the stream, and, spreading his sails, the vessels passed out of the little river roadstead of Palos, gazed after, perhaps, in the increasing light, as the little crafts reached the ocean, by the friar of Rabida, from its distant promontory of rock.

The day was Friday, and the advocates of Columbus's canonization have not failed to see a purpose in its choice as the day of our Redemption, and as that of the deliverance of the Holy Sepulchre by Geoffrey de Bouillon, and of the rendition of Granada, with the fall of the Moslem power in Spain. We must resort to the books of such advocates, if we would enliven the picture with a multitude of rites and devotional feelings that they gather in the meshes of the story of the departure. They supply to the embarkation a variety of detail that their holy purposes readily imagine, and place Columbus at last on his poop, with the standard of the Cross, the image of the

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Saviour nailed to the holy wood, waving in the early breeze that heralded the day. The embellishments may be pleasing, but they are not of the strictest authenticity.

In order that his performance of an embassy to the princes of the East might be duly chronicled, Columbus determined, as his journal says, to keep an account of the voyage by the west, "by which course," he says, "unto the present time, we do not know, *for certain*, that any one has passed." It was his purpose to write down, as he proceeded, everything he saw and all that he did, and to make a chart of his discoveries, and to show the directions of his track.

Nothing occurred during those early August days to mar his run to the Canaries, except the apprehension which he felt that an accident, happening to the rudder of the *Pinta*,—a steering gear now for some time in use, in place of the old lateral blades,—was a trick of two men, her owners, Gomez Rascon and Christopher Quintero, to impede a voyage in which they had no heart. The Admiral knew the disposition of these men well enough not to be surprised at the mishap, but he tried to feel secure in the prompt energy of Pinzon, who commanded the *Pinta*.

As he passed (August 24-25, 1492) the peak of Teneriffe, it was the time of an eruption, of which he makes bare mention in his journal. It is to the corresponding passage of the *Historic*, [written by his son, Fernando,] that we owe the somewhat sensational stories

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of the terrors of the sailors, some of whom certainly must long have been accustomed to like displays in the volcanoes of the Mediterranean.

At the Gran Canarie the *Nina* was left to have her lateen sails changed to square ones; and the *Pinta*, it being found impossible to find a better vessel to take her place, was also left to be overhauled for her leaks, and to have her rudder again repaired, while Columbus visited Gomera, another of the islands. The fleet was reunited at Gomera on September 2. Here he fell in with some residents of the Ferro, the westernmost of the group, who repeated the old stories of land occasionally seen from its heights, lying towards the setting sun. Having taken on board wood, water, and provisions, Columbus finally sailed from Gomera on the morning of Thursday, September 6. He seems to have soon spoken a vessel from Ferro, and from this he learned that three Portuguese caravels were lying in wait for him in the neighbourhood of that island, with a purpose, as he thought, of visiting in some way upon him, for having gone over to the interests of Spain, the indignation of the Portuguese king. He escaped encountering them.

Up to Sunday, September 9, they had experienced so much calm weather, that their progress had been slow. This tediousness soon raised an apprehension in the mind of Columbus that the voyage might prove too long for the constancy of his men. He accordingly determined to falsify his reckoning. This deceit was

a large confession of his own timidity in dealing with his crew, and it marked the beginning of a long struggle with deceived and mutinous subordinates, which forms so large a part of the record of his subsequent career.

The result of Monday's sail, which he knew to be sixty leagues, he noted as forty-eight, so that the distance from home might appear less than it was. He continued to practise this deceit.

The distances given by Columbus are those of dead reckoning beyond any question. Lieutenant Murdock, of the United States Navy, who has commented on this voyage, makes his league the equivalent of three modern nautical miles, and his mile about three-quarters of our present estimate for that distance. Navarrete says that Columbus reckoned in Italian miles, which are a quarter less than Spanish miles. The Admiral had expected to make land after sailing about seven hundred leagues from Ferro; and in ordering his vessels in case of separation to proceed westward, he warned them when they sailed that distance to come to the wind at night, and only to proceed by day.

The log as at present understood in navigation had not yet been devised. Columbus depended in judging of his distance on the eye alone, basing his calculations on the passage of objects or bubbles past the ship, while the running out of his hour glasses afforded the multiple for long distances.

On Thursday, the 13th of September, he notes

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that the ships were encountering adverse currents. He was now three degrees west of Flores, and the needle of the compass pointed as it had never been observed before, directly to the true north. His observation of this fact marks a significant point in the history of navigation. The polarity of the magnet, an ancient possession of the Chinese, had been known perhaps for three hundred years, when this new spirit of discovery awoke in the fifteenth century. The Indian Ocean and its traditions were to impart, perhaps through the Arabs, perhaps through the returning Crusaders, a knowledge of the magnet to the dwellers on the shores of the Mediterranean, and to the hardier mariners who had pushed beyond the pillars of Hercules, so that the new route to that same Indian Ocean was made possible in the fifteenth century. The way was prepared for it gradually. The Catalans from the port of Barcelona pushed out into the great Sea of Darkness under the direction of their needles, as early at least as the twelfth century. The pilots of Genoa and Venice, the hardy Majorcans and the adventurous Moors, were followers of almost equal temerity.

A knowledge of the variation of the needle came more slowly to be known to the mariners of the Mediterranean. It had been observed by Peregrini as early as 1269, but that knowledge of it which rendered it greatly serviceable in voyages does not seem to be plainly indicated in any of the charts of these transition centuries,

till we find it laid down on the maps of Andrea Bianco in 1436.

It was no new thing then when Columbus, as he sailed westward, marked the variation, proceeding from the northeast more and more westerly; but it was a revelation when he came to a position where the magnetic north and the north star stood in conjunction, as they did on this 13th of September, 1492. As he still moved westerly the magnetic line was found to move farther and farther away from the pole as it had before the 13th approached it. To an observer of Columbus's quick perceptions, there was a ready guess to possess his mind. This inference was that this line of no variation was a meridian line, and that divergence from it east and west might have a regularity which would be found to furnish a method of ascertaining longitude far easier and surer than tables or water clocks. We know that four years later he tried to sail his ship on observations of this kind. The same idea seems to have occurred to Sebastian Cabot, when a little afterwards he approached and passed in a higher latitude, what he supposed to be the meridian of no variation. Humboldt is inclined to believe that the possibility of such a method of ascertaining longitude was that uncommunicable secret, which Sebastian Cabot many years later hinted at on his death-bed.

The claim was made near a century later by Livio Sanuto in his *Geographia*, published at Venice, in 1588, that Sebastian Cabot had been

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the first to observe this variation, and had explained it to Edward VI., and that he had on a chart placed the line of no variation at a point one hundred and ten miles west of the island of Flores in the Azores.

These observations of Columbus and Cabot were not wholly accepted during the sixteenth century. Robert Hues, in 1592, a hundred years later, tells us that Medina, the Spanish grand pilot, was not disinclined to believe that mariners saw more in it than really existed and that they found it a convenient way to excuse their own blunders. Nonius was credited with saying that it simply meant that worn-out magnets were used, which had lost their power to point correctly to the pole. Others had contended that it was through insufficient application of the loadstone to the iron that it was so devious in its work.

What was thought possible by the early navigators possessed the minds of all seamen in varying experiments for two centuries and a half. Though not reaching such satisfactory results as were hoped for, the expectation did not prove so chimerical as was sometimes imagined when it was discovered that the lines of variation were neither parallel, nor straight, nor constant. The line of no variation which Columbus found near the Azores had moved westward with erratic inclinations, until to-day it is not far from a straight line from Carolina to Guinea. Science, beginning with its crude efforts at the hands of

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Alonzo de Santa Cruz, in 1530, has so mapped the surface of the globe with observations of its multifarious freaks of variation, and the changes are so slow, that a magnetic chart is not a bad guide to-day for ascertaining the longitude in any latitude for a few years neighbouring to the date of its records. So science has come around in some measure to the dreams of Columbus and Cabot.

But this was not the only development which came from this ominous day in the mid-Atlantic in that September of 1492. The fancy of Columbus was easily excited, and notions of a change of climate, and even aberration of the stars were easily imagined by him amid the strange phenomena of that untracked waste.

While Columbus was suspecting that the north star was somewhat wilfully shifting from the magnetic pole, now to a distance of  $5^{\circ}$  and then of  $10^{\circ}$ , the calculations of modern astronomers have gauged the polar distance existing in 1492 at  $3^{\circ} 28'$ , as against the  $1^{\circ} 20'$  of to-day. The confusion of Columbus was very like his confounding an old world with a new, inasmuch as he supposed it was the pole star and not the needle which was shifting.

He argued from what he saw, or what he thought he saw, that the line of no variation marked the beginning of a protuberance of the earth, up which he ascended as he sailed westerly, and that this was the reason of the cooler weather which he experienced. He never got over some

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notions of this kind, and he believed he found confirmation of them in his later voyages.

Even as early as the reign of Edward III. of England, Nicholas of Lynn, a voyager to the northern seas, is thought to have definitely fixed the magnetic pole in the Arctic regions, transmitting his views to Cnoyen, the master of the later Mercator, in respect to the four circumpolar islands, which in the sixteenth century made so constant a surrounding of the north pole.

The next day (September 14), after these magnetic observations, a water wagtail was seen from the *Nina*,—a bird which Columbus thought unaccustomed to fly over twenty-five leagues from land, and the ships were now, according to their reckoning, not far from two hundred leagues from the Canaries. On Saturday they saw a distant bolt of fire fall into the sea. On Sunday, they had a drizzling rain, followed by pleasant weather, which reminded Columbus of the nightingales, gladdening the climate of Andalusia in April. They found around the ships much green floatage of weeds, which led them to think some islands must be near. Navarrete thinks there was some truth in this, inasmuch as the charts of the early part of this century represent breakers as having been seen in 1802, near the spot where Columbus can be computed to have been at this time. Columbus was in fact within that extensive *prairie* of floating seaweed which is known as the Sargasso Sea, whose principal longitudinal axis is found in modern times to lie along the

parallel of  $41^{\circ} 30'$ , and the best calculations which can be made from the rather uncertain data of Columbus's journal seem to point to about the same position.

There is nothing in all these accounts, as we have them abridged by La Casas, to indicate any great surprise, and certainly nothing of the overwhelming fear which, the *Historic* tells us, the sailors experienced when they found their ships among these floating masses of weeds, raising apprehension of a perpetual entanglement in their swashing folds.

The next day (September 17) the currents became favourable, and the weeds still floated about them. The variation of the needle now became so great that the scamen were dismayed, as the journal says, and the observation being repeated Columbus practised another deceit and made it appear that there had been really no variation, but only a shifting of the polar star! The weeds were now judged to be river weeds, and a live crab was found among them,—a sure sign of near land, as Columbus believed, or affected to believe. They killed a tunny and saw others. They again observed a water wag-tail, "which does not sleep at sea." Each ship pushed on for the advance, for it was thought the goal was near. The next day the *Pinta* shot ahead and saw great flocks of birds towards the west. Columbus conceived that the sea was growing fresher. Heavy clouds hung on the northern horizon, a sure sign of land, it was supposed.

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On the next day two pelicans came on board, and Columbus records that these birds are not accustomed to go twenty leagues from land. So he sounded with a line of two hundred fathoms to be sure he was not approaching land; but no bottom was found. A drizzling rain also betokened land, which they could not stop to find, but would search for on their return, as the journal says. The pilots now compared their reckonings. Columbus said they were 400 leagues, while the *Pinta's* record showed 420, and the *Nina's* 440.

On September 20 other pelicans came on board; and the ships were again among the weeds. Columbus was determined to ascertain if these indicated shoal water and sounded, but could not reach bottom. The men caught a bird with feet like a gull; but they were convinced it was a river bird. Then singing land birds, as was fancied, hovered about as it darkened, but they disappeared before morning. Then a pelican was observed flying to the southwest, and as "these birds sleep on shore, and go to sea in the morning," the men encouraged themselves with the belief that they could not be far from land. The next day a whale could be but another indication of land; and the weeds covered the sea all about. On Saturday, they steered west by northwest, and got clear of the weeds. This change of course so far to the north, which had begun on the previous day, was occasioned by a head wind, and Columbus says he welcomed it,

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because it had the effect of convincing the sailors that westerly winds to return by were not impossible. On Sunday (September 23), they found the wind still varying; but they made more westering than before,—weeds, crabs, and birds still about them. Now there was smooth water, which again depressed the seamen; then the sea arose, mysteriously, for there was no wind to cause it. They still kept their course westerly and continued it till the night of September 25.

Columbus at this time conferred with Pinzon, as to a chart which they carried, which showed some islands, near where they now supposed the ships to be. That they had not seen land, they believed was either due to currents which had carried them too far north, or else their reckoning was not correct. At sunset Pinzon hailed the Admiral, and said he saw land, claiming the reward. The two crews were confident that such was the case, and under the lead of their commanders they all kneeled and repeated the *Gloria in Excelsis*. The land appeared to lie southwest, and everybody saw the apparition. Columbus changed the fleet's course to reach it; and as the vessels went on, in the smooth sea, the men had the heart, under their expectation, to bathe in its amber glories. On Wednesday, they were undeceived, and found that the clouds had played them a trick. On the 27th their course lay more directly west. So they went on, and still remarked upon all the birds they saw

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and weed-drift which they pierced. Some of the fowl they thought to be such as were common at the Cape Verde Islands, and were not supposed to go far to sea. On the 30th of September, they still observed the needles of their compasses to vary, but the journal records that it was the pole star which moved, and not the needle. On October 1, Columbus says they were 707 leagues from Ferro; but he had made his crew believe they were only 584. As they went on, little new for the next few days is recorded in the journal; but on October 3, they thought they saw among the weeds something like fruits. By the 6th, Pinzon began to urge a southwesterly course, in order to find the islands, which the signs seemed to indicate in that direction. Still the Admiral would not swerve from his purpose, and kept his course westerly. On Sunday the *Nina* fired a bombard and hoisted a flag as a signal that she saw land, but it proved a delusion. Observing towards evening a flock of birds flying to the southwest, the Admiral yielded to Pinzon's belief, and shifted his course to follow the birds. He records as a further reason for it that it was by following the flights of birds that the Portuguese had been so successful in discovering islands in other seas.

Columbus now found himself two hundred miles and more farther than the three thousand miles west of Spain, where he supposed Cipango to lie, and he was  $25\frac{1}{2}^{\circ}$  north of the equator, according to his astrolabe. The true distance

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of Cipango or Japan was sixty-eight hundred miles still farther, or beyond both North America and the Pacific. How much beyond that island, in its supposed geographical position, Columbus expected to find the Asiatic main we can only conjecture from the restorations which modern scholars have made of Toscanelli's map, which makes the island about  $10^{\circ}$  east of Asia, and from Behaim's globe, which makes it  $20^{\circ}$ . It should be borne in mind that the knowledge of its position came from Marco Polo, and he does not distinctly say how far it was from the Asiatic coast. In a general way, as to these distances from Spain to China, Toscanelli and Behaim agreed, and there is no reason to believe that the views of Columbus were in any noteworthy degree different.

In the trial years afterward, when the Fiscal contested the rights of Diego Colon, it was put in evidence by one Vallejo, a seaman, that Pinzon was induced to urge the direction to be changed to the southwest, because he had in the preceding evening observed a flight of parrots in that direction, which could have only been seeking land. It was the main purpose of the evidence in this part of the trial to show that Pinzon had all along forced Columbus forward against his will.

How pregnant this change of course in the vessels of Columbus was has not escaped the observation of Humboldt and many others. A day or two further on his westerly way, and

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the Gulf Stream would, perhaps, insensibly have borne the little fleet up the Atlantic coast of the future United States, so that the banner of Castile might have been planted at Carolina.

On the 7th of October, Columbus was pretty nearly in latitude  $25^{\circ} 50'$ ,—that of one of the Bahama Islands. Just where he was by longitude there is much more doubt, probably between  $65^{\circ}$  and  $66^{\circ}$ . On the next day the land birds flying along the course of the ships seemed to confirm their hopes. On the 10th the journal records that the men began to lose patience; but the Admiral reassured them by reminding them of the profits in store for them, and of the folly of seeking to return when they had already gone so far.

It is possible that, in this entry, Columbus conceals the story which came out later in the recital of Oviedo, with more detail than in the *Historie* and Las Casas, that the rebellion of his crew was threatening enough to oblige him to promise to turn back if land was not discovered in three days. Most commentators, however, are inclined to think that this story of a mutinous revolt was merely engrafted from hearsay or other source by Oviedo upon the more genuine recital, and that the conspiracy to throw the Admiral into the sea has no substantial basis in contemporary report. Irving, who has a dramatic tendency throughout his whole account of the voyage to heighten his recital with touches of the imagination, nevertheless allows this, and

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thinks that Oviedo was misled by listening to a pilot, who was a personal enemy of the Admiral.

The elucidations of the voyage which were drawn out in the famous suit of Diego with the Crown in 1513 and 1515, afford no ground for any belief in this story of the mutiny and the concession of Columbus to it.

It is not, however, difficult to conceive the recurrent fears of his men and the incessant anxiety of Columbus to quiet them. From what Peter Martyr tell us,—and he may have got it directly from Columbus's lips,—the task was not an easy one to preserve subordination and to instil confidence. He represents that Columbus was forced to resort in turn to argument, persuasion and enticements, and to picture the misfortunes of the royal displeasure.

The next day, notwithstanding a heavier sea than they had before encountered, certain signs sufficed to lift them out of their despondency. These were floating logs, or pieces of wood, one of them apparently carved by hand, bits of cane, a green rush, a stalk of rose berries and other drifting tokens.

Their southwesterly course had now brought them down to about the twenty-fourth parallel, when after sunset on the 11th they shifted their course to due west, while the crew of the Admiral's ship united, with more fervour than usual, in the *Salve Regina*. At about ten o'clock Columbus, peering into the night, thought he saw—if we may believe him—a moving light,

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and pointing out the direction to Pero Gutierrez, this companion saw it too; but another, Rodrigo Sanchez, situated apparently on another part of the vessel, was not able to see it. It was not brought to the attention of any others. The Admiral says that the light seemed to be moving up and down, and he claimed to have got other glimpses of its glimmer at a later moment. He ordered the *Salve* to be chanted, and directed a vigilant watch to be set on the forecastle. To sharpen their vision he promised a silken jacket, beside the income of ten thousand maravedis which the King and Queen had offered to the fortunate man who should first descry the coveted land.

This light has been the occasion of such comment, and nothing will ever, it is likely, be settled about it, further than that the Admiral, with an inconsiderate rivalry of a common sailor, who later saw the actual land, and with an ungenerous assurance, ill-befitting a commander, pocketed a reward which belonged to another. If Oviedo, with his prejudices, is to be believed, Columbus was not even the first who claimed to have seen this dubious light. There is a common story that the poor sailor, who was defrauded, later turned Mohammedan and went to live among that juster people. There is a sort of retributive justice in the fact that the pension of the Crown was made a charge upon the shambles of Seville, and thence Columbus received it till he died.

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Whether the light is to be considered a reality or a fiction will depend much on the theory each may hold regarding the position of the landfall. When Columbus claimed to have discovered it, he was twelve or fourteen leagues away from the island, where four hours later land was indubitably found. Was the light on a canoe? Was it on some small, outlying island, as has been suggested? Was it a torch carried from hut to hut, as Herrera avers? Was it on either of the other vessels? Was it on the low island on which, the next morning he landed? There was no elevation on that island sufficient to show even a strong light at a distance of ten leagues. Was it a fancy or a deceit? No one can say. It is very difficult for Navarrete, and even for Irving, to rest satisfied with what after all may have been only an illusion of a fevered mind, making a record of the incident in the excitement of a wonderful hour, when his intelligence was not as circumspect as it might have been.

Four hours after the light was seen, at two o'clock in the morning, when the moon, near its third quarter, was in the east, the *Pinta*, keeping ahead, one of her sailors, Rodrigo de Triane descried the land two leagues away, and a gun communicated the joyful intelligence to the other ships. The fleet took in sail, and each vessel, under backed canvas, was pointed to the wind. Thus they waited for daybreak. It was a proud moment of painful suspense for Colum-

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bus; and brimming hopes, perhaps fears of disappointment, must have accompanied that hour of wavering enchantment. It was Friday, October 12, of the old chronology, and the little fleet had been thirty-three days on its way from the Canaries, and we must add ten days more to complete the period since they left Palos. The land before them was seen, as the day dawned, to be a small island, "called in the Indian tongue" Guanahani. Some naked natives were descried. The Admiral and the commanders of the other vessels prepared to land. Columbus took the royal standard and the others each a banner of the green cross, which bore the initials of the sovereign with a cross between, a crown surmounting every letter. Thus, with the emblems of their power, and accompanied by Rodrigo de Escoveda and Rodrigo Sanchez and some seamen, the boat rowed to the shore. They immediately took formal possession of the land, and the notary recorded it.

The words of the prayer usually given as uttered by Columbus on taking possession of San Salvador, when he named the island, cannot be traced farther back than a collection of *Tablas Chronologicas*, got together at Valencia in 1689, by a Jesuit father, Claudio Clemente. Harrisse finds no authority for the statement of the French canonizers that Columbus established a form of prayer which was long in vogue, for such occupations of new lands.

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Las Casas, from whom we have the best account of the ceremonies of the landing, does not mention it; but we find pictured in his pages the grave impressiveness of the hour; the form of Columbus, with a crimson robe over his armour, central and grand; and the humbleness of his followers in their contrition for the hours of their faint-heartedness.

Columbus now enters in his journal his impressions of the island and its inhabitants. He says of the land that it bore green trees, was watered by many streams, and produced divers fruits. In another place he speaks of the island as flat, without lofty eminence, surrounded by reefs, with a lake in the interior.

The courses and distances of his sailing both before and on leaving the island, as well as this description, are the best means we have of identifying the spot of this portentous landfall. The early maps may help in a subsidiary way, but with little precision.

There is just enough uncertainty and contradiction respecting the data and arguments applied in the solution of this question, to render it probable that men will never quite agree which of the Bahamas it was upon which these startled and exultant Europeans first stepped. Though Las Casas reports the journal of Columbus unabridged for a period after the landfall, he unfortunately condenses it for some time previous. There is apparently no chance of finding geographical conditions that in every

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respect will agree with this record of Columbus, and we must content ourselves with what offers the fewest disagreements. An obvious method, if we could depend on Columbus's dead reckoning, would be to see for what island the actual distance from the Canaries would be nearest to his computed run; but currents and errors of the eye necessarily throw this sort of computation out of the question, and Captain G. A. Fox, who has tried it, finds that Cat Island is three hundred and seventeen, the Grand Turk six hundred and twenty-four nautical miles, and the other supposable points at intermediate distances out of the way as compared with his computation of the distance run by Columbus, three thousand four hundred and fifty-eight of such miles.

The reader will remember the Bahama group as a range of islands, islets, and rocks, said to be some three thousand in number, running south-east from a point part way up the Florida coast, and approaching at the other end the coast of Hispaniola. In the latitude of the lower point of Florida, and five degrees east of it, is the island of San Salvador or Cat Island, which is the most northerly of those claimed to have been the landfall of Columbus. Proceeding down the group, we encounter Watling's, Samana, Acklin (with the Plana Cays), Mariguana, and the Grand Turk,—all of which have their advocates. The three methods of identification which have been followed are, first, by plotting

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the outward track; second, by plotting the track between the landfall and Cuba, both forward and backward; third, by applying the descriptions, particularly Columbus's, of the island first seen. In this last test, Harrisse prefers to apply the description of Las Casas, which is borrowed in part from that of the *Historie*, and he reconciles Columbus's apparent discrepancy when he says in one place that the island was "pretty large," and in another "small," by supposing that he may have applied these opposite terms, the lesser to the Plana Cays, as first seen, and the other to the Crooked Group, or Acklin Island, lying just westerly, on which he may have landed. Harrisse is the only one who makes this identification; and he finds some confirmation in later maps, which show thereabout an island, Triango or Triangulo, a name said by Las Casas to have been applied to Guanahani at a later day. There is no known map earlier than 1540 bearing this alternative name of Triango.

San Salvador seems to have been the island selected by the earliest of modern inquirers in the seventeenth and eighteenth centuries, and it has had the support of Irving and Humboldt in later times. Captain Alexander Slidell Mackenzie of the United States navy worked out the problem for Irving. It is much larger than any of the other islands, and could hardly have been called by Columbus in any alternative way a "small" island, while it does not

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answer Columbus's description of being level, having on it an eminence of four hundred feet, and no interior lagoon, as his Guanahani demands. The French canonizers stand by the old traditions, and find it meet to say that "the English Protestants not finding the name of San Salvador fine enough have substituted for it that of Cat, and in their hydrographical atlases the Island of the Holy Saviour is nobly called Cat Island."

The weight of modern testimony seems to favour Watling's Island, and it so far answers Columbus's description that about one-third of its interior is water, corresponding to his "large lagoon." Muñoz first suggested it in 1793; but the arguments in its favour were first spread out by Captain Becher of the royal navy in 1856, and he seems to have induced Oscar Peschel in 1858 to adopt the same views in his history of the range of modern discovery. Major, the map custodian of the British Museum, who had previously followed Navarrete in favouring the Grand Turk, again addressed himself to the problem in 1870, and fell into line with the adherents of Watling's. No other considerable advocacy of this island, if we except the testimony of Gerard Stein in 1883, in a book on voyages of discovery, appeared till Lieutenant J. B. Murdoch, an officer of the American navy, made a very careful examination of the subject in the *Proceedings of the United States Naval Institute* in 1884, which is accepted by

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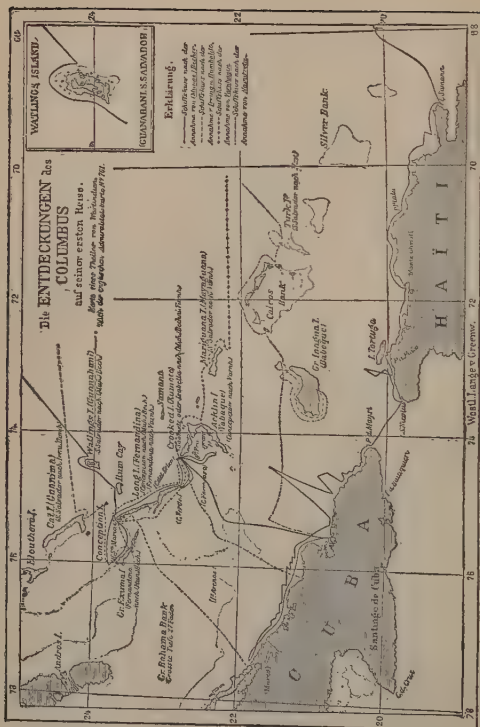
Charles A. Schott in the *Bulletin of the United States Coast Survey*. Murdoch was the first to plot in a backward way the track between Guanahani and Cuba, and he finds more points of resemblance in Columbus's description with Watling's than with any other. The latest adherent is the eminent geographer, Clements R. Markham, in the bulletin of the Italian Geographical Society in 1889. Perhaps no cartographical argument has been so effective as that of Major in comparing modern charts with the map of Herrera, in which the latter lays Guanahani down.

An elaborate attempt to identity Samana as the landfall was made by the late Captain Gustavus Vasa Fox, in an appendix to the *Report of the United States Coast Survey* for 1880. Varnhagen, in 1864, selected Mariguana, and defended his choice in a paper. This island fails to satisfy the physical conditions in being without interior water. Such a qualification, however, belongs to the Grand Turk Island, which was advocated first by Navarrete in 1826, whose views have since been supported by George Gibbs, and for a while by Major.

It is rather curious to note that Caleb Cushing, who undertook to examine this question in the *North American Review*, under the guidance of Navarrete's theory, tried the same backward method which has been later applied to the problem, but with quite different results from those reached by more recent investiga-

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tors. He says, "By setting out from Nipe which is the point where Columbus struck Cuba and proceeding in a retrograde direction along his course, we may surely trace his path, and shall be convinced that Guanahani is no other than Turk's Island."



## LEWIS AND CLARKE REACH THE PACIFIC OCEAN

[In 1804-6 Captains Lewis and Clarke, by order of the Government of the United States, commanded an expedition to the sources of the Missouri, thence across the Rocky Mountains and down the River Columbia to the Pacific Ocean. Chapter IV., which follows, is taken from the second volume of the History of the Expedition, published by Harper & Brothers, New York, 1842. The matter of the original journal is indicated by inverted commas, and where portions of it embracing minute and uninteresting particulars, have been omitted, the leading facts have been briefly stated by the editor, Archibald McVickar, in his own words, so that the connection of the narrative is preserved unbroken and nothing of importance is lost to the reader. The History of the Expedition, edited, with notes by Elliott Coues, was published in 1893 in four volumes by Francis P. Harper, New York. This edition surpasses every other in its excellence: it has passed out of print, but may be found in many public libraries. In 1901 Houghton, Mifflin & Co., Boston, published "Lewis and Clark," by Wm. R. Lighton: within one hundred and fifty-nine small pages the story of the famous expedition is admirably condensed. Good portraits of Lewis and Clark form the frontispiece.

*"November 2, 1805. We now examined the rapid below more particularly, and the danger appearing to be too great for the loaded canoes, all those who could not swim were sent with the baggage by land. The canoes then passed safely down and were reloaded. At the foot of the rapid we took a meridian altitude and found our latitude to be 59° 45' 45"."*

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This rapid forms the last of the descents of the Columbia; and immediately below it the river widens, and tidewater commences. Shortly after starting they passed an island three miles in length and to which, from that plant being seen on it in great abundance, they gave the name of Strawberry Island. Directly beyond were three small islands, and in the meadow to the right, at some distance from the hills in the background was a single perpendicular rock, which they judged to be no less than eight hundred feet high and four hundred yards at the base, which they called Beacon Rock. A little farther on they found the river a mile in breadth, and double this breadth four miles beyond. After making twenty-nine miles from the foot of the Great Shoot, they halted for the night at a point where the river was two and a half miles wide. The character of the country they had passed through during the day was very different from that they had lately been accustomed to, the hills being thickly covered with timber, chiefly of the pine species. The tide rose at their encampment about nine inches, and they saw great numbers of waterfowl, such as swan, geese, ducks of various kinds, gulls, etc.

The next day, *November 3d*, they set off in company with some Indians who had joined them the evening before. At the distance of three miles they passed a river on the left, to which, from the quantity of sand it bears along

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with it, they gave the name of Quicksand River. So great, indeed, was the quantity it had discharged into the Columbia, that the river was compressed to the width of half a mile, and the whole force of the current thrown against the right shore. Opposite this was a large creek, which they called Seal River. The mountain which they had supposed to be the Mount Hood of Vancouver, now bore S.  $85^{\circ}$  E., about forty-seven miles distant. About three miles farther on they passed the lower mouth of Quicksand River, opposite to which was another large creek, and near it the head of an island three miles and a half in extent; and half a mile beyond it was another island, which they called Diamond Island, opposite to which they encamped, having made but thirteen miles' distance. Here they met with some Indians ascending the river, who stated that they had seen three vessels at its mouth.

"Below Quicksand River," says the Journal, "the country is low, rich, and thickly wooded on each side of the Columbia; the islands have less timber, and on them are numerous ponds, near which were vast quantities of fowl, such as swan, geese, brant, cranes, storks, white gulls, cormorants, and plover. The river is wide and contains a great number of sea-otters. In the evening the hunters brought in game for a sumptuous supper."

In continuing their descent the next day, they found Diamond Island to be six miles in

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length and three broad; and near its termination were two other islands. "Just below the last of these," proceeds the narrative, "we landed on the left bank of the river, at a village of twenty-five houses, all of which were thatched with straw, and built of bark except one, which was about fifty feet long and constructed of boards, in the form of those higher up the river, from which it differed, however, in being completely above ground, and covered with broad, split boards. This village contained about two hundred men of the Skilloot nation, who seemed well provided with canoes, of which there were at least fifty-two, and some of them very large, drawn up in front of the village. On landing, we found an Indian from above, who had left us this morning, and who now invited us into a lodge of which he appeared to be part owner. Here he treated us with a root, round in shape and about the size of a small Irish potato, which they call *wappatoo*: it is the common arrow-head or *sagittifolia* so much cultivated by the Chinese, and, when roasted in the embers till it becomes soft, has an agreeable taste, and is a very good substitute for bread. After purchasing some of this root we resumed our journey, and at seven miles' distance came to the head of a large island near the left bank. On the right shore was a fine open prairie for about a mile, back of which the country rises, and is well supplied with timber, such as white oak, pine of different kinds, wild crab, and

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several species of undergrowth, while along the borders of the river there were only a few cottonwood and ash trees. In this prairie were also signs of deer and elk.

"When we landed for dinner a number of Indians came down, for the purpose, as we supposed, of paying us a friendly visit, as they had put on their finest dresses. In addition to their usual covering, they had scarlet and blue blankets, sailor's jackets and trowsers, shirts, and hats. They had all of them either war-axes, spears, and bows and arrows, or muskets and pistols, with tin powder-flasks. We smoked with them, and endeavoured to show them every attention, but soon found them very assuming and disagreeable companions. While we were eating, they stole the pipe with which they were smoking, and a great coat of one of the men. We immediately searched them all, and found the coat stuffed under the root of a tree near where they were sitting; but the pipe we could not recover. Finding us discontented with them, and determined not to suffer any imposition, they showed their displeasure in the only way they dared, by returning in ill humour to their village. We then proceeded, and soon met two canoes, with twelve men of the same Skilloot nation, who were on their way from below. The larger of the canoes was ornamented with the figures of a bear in the bow and a man in the stern, both nearly as large as life, both made of painted wood, and very neatly fastened

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to the boat. In the same canoe were two Indians gaudily dressed, and with round hats. This circumstance induced us to give the name of Image Canoe to the large island, the lower end of which we were now passing, at the distance of nine miles from its head. We had seen two smaller islands to the right, and three more near its lower extremity." . . . "The river was now about a mile and a half in width, with a gentle current, and the bottoms extensive and low, but not subject to be overflowed. Three miles below Image Canoe Island we came to four large houses on the left side; here we had a full view of the mountain which we had first seen from the Muscleshell Rapid on the 19th of October, and which we now found to be, in fact, the Mount St. Helen of Vancouver. It bore north  $25^{\circ}$  east, about ninety miles distant, rose in the form of a sugar loaf to a very great height, and was covered with snow. A mile lower we passed a single house on the left, and another on the right. The Indians had now learned so much of us that their curiosity was without any mixture of fear, and their visits became very frequent and troublesome. We therefore continued on till after night, in hopes of getting rid of them; but, after passing a village on each side, which, on account of the lateness of the hour, we could only see indistinctly, we found there was no escaping from their importunities. We accordingly landed at the distance of seven miles below Image Canoe

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Island, and encamped near a single house on the right, having made during the day twenty-nine miles.

"The Skilloots that we passed to-day speak a language somewhat different from that of the Echeloots or Chilluckittequaws near the long narrows. Their dress, however, is similar, except that the Skilloots possess more articles procured from the white traders; and there is this farther difference between them, that the Skilloots, both males and females, have the head flattened. Their principal food is fish, *wappatoo* roots, and some elk and deer, in killing which with arrows they seem to be very expert; for during the short time we remained at the village three deer were brought in. We also observed there a tame *blaireau* [badger].

"As soon as we landed we were visited by two canoes loaded with Indians, from whom we purchased a few roots. The grounds along the river continued low and rich, and among the shrubs were large quantities of vines resembling the raspberry. On the right the low grounds were terminated at the distance of five miles by a range of high hills covered with tall timber, and running southeast and northwest. The game, as usual, was very abundant; and, among other birds, we observed some white geese, with a part of their wings black."

Early the next morning they resumed their voyage, passing several islands in the course of the day, the river alternately widening and

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contracting, and the hills sometimes retiring from, and at others approaching, its banks. They stopped for the night at the distance of thirty-two miles from their last encampment. "Before landing," proceeds the Journal, "we met two canoes, the largest of which had at the bow the image of a bear, and that of a man on the stern: there were twenty-six Indians on board, but they proceeded upwards, and we were left, for the first time since we reached the waters of the Columbia, without any of the natives with us during the night. Besides other game, we killed a grouse much larger than the common kind, and observed along the shore a number of striped snakes. The river is here deep, and about a mile and a half in width. Here, too, the ridge of low mountains, running northwest and southeast, crosses the river and forms the western boundary of the plain through which we had just passed. This great plain or valley begins above the mouth of Quicksand River, and is about sixty miles long in a straight line, while on the right and left it extends to a great distance; it is a fertile and delightful country, shaded by thick groves of tall timber, and watered by small ponds on both sides of the river. The soil is rich and capable of any species of culture; but in the present condition of the Indians, its chief production is the *wap-patoo* root, which grows spontaneously and exclusively in this region. Sheltered as it is on both sides, the temperature is much milder

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than that of the surrounding country; for even at this season of the year we observed but very little appearance of frost. It is inhabited by numerous tribes of Indians, who either reside in it permanently, or visits its waters in quest of fish and *wappatoo* roots. We gave it the name of the Columbia Valley.

"*November 6.* The morning was cool and rainy. We proceeded at an early hour between high hills on both sides of the river, till at the distance of four miles we came to two tents of Indians in a small plain on the left, where the hills on the right recede a few miles, and a long, narrow inland stretches along the right shore. Behind this island is the mouth of a large river, a hundred and fifty yards wide, called by the Indians Coweliske. We halted on the island for dinner, but the redwood and green briars were so interwoven with the pine, alder, ash, a species of beech, and other trees, that the woods formed a thicket which our hunters could not penetrate. Below the mouth of the Coweliske a very remarkable knob rises from the water's edge to the height of eighty feet, being two hundred paces round the base; and as it is in a low part of the island, and at some distance from the high grounds, its appearance is very singular. On setting out after dinner we overtook two canoes going down to trade. One of the Indians, who spoke a few words of English, mentioned that the principal person who traded with them was a Mr. Haley;

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and he showed us a bow of iron and several other things, which he said he had given him. Nine miles below Coweliske River is a creek on the same side; and between them three smaller islands, one on the left shore, the other about the middle of the river, and a third near the lower end of the long, narrow island, and opposite a high cliff of black rocks on the left, sixteen miles from our last night's encampment. Here we were overtaken by some Indians from the two tents we had passed in the morning, from whom we purchased *wappatco* roots, salmon, trout, and two beaver-skins, for which last we gave five small fish-hooks."

Here the mountains which had been high and rugged on the left, retired from the river, as had the hills on the right, since leaving the Coweliske, and a beautiful plain was spread out before them. They met with several islands on their way, and having at the distance of five miles come to the termination of the plain, they proceeded for eight miles through a hilly country, and encamped for the night after having made twenty-nine miles.

"*November 7.* The morning," proceeds the narrative, "was rainy, and the fog so thick that we could not see across the river. We observed, however, opposite to our camp, the upper point of an island, between which and the steep hills on the right we proceeded for five miles. Three miles lower was the beginning of an island, separated from the right

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shore by a narrow channel: down this we proceeded under the direction of some Indians whom we had just met going up the river, and who returned in order to show us their village. It consisted of four houses only, situated on this channel, behind several marshy islands formed by two small creeks. On our arrival they gave us some fish, and we afterwards purchased *wappatoo* roots, fish, three dogs, and two otter-skins, for which we gave fish-hooks chiefly, that being an article which they are very anxious to obtain.

“These people seemed to be of a different nation from those we had just passed: they were low in stature, ill-shaped, and all had their heads flattened. They called themselves Wahkiacum, and their language differed from that of the tribes above, with whom they trade for *wappatoo* roots. The houses, too, were built in a different style, being raised entirely above ground, with the eaves about five feet high, and the door at the corner. Near the end opposite to the door was a single fireplace, round which were the beds, raised four feet from the floor of earth; over the fire were hung fresh fish, and when dried they are stowed away with the *wappatoo* roots under the beds. The dress of the men was like that of the people above; but the women were clad in a peculiar manner, the robe not reaching lower than the hip, and the body being covered in cold weather by a sort of corset of fur, curiously plaited, and

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reaching from the arms to the hip: added to this was a sort of petticoat, or, rather, tissue of white cedar bark, bruised or broken into small strands and woven into a girdle by several cords of the same material. Being tied round the middle, these strands hang down as low as the knee in front and to the middle of the leg behind: sometimes the tissue consists of strings of silk-grass, twisted and knotted at the end.

“After remaining with them about an hour, we proceeded down the channel with an Indian dressed in a sailor's jacket for our pilot; and, on reaching the main channel, were visited by some Indians, who have a temporary residence on a marshy island, Tenasillihee, in the middle of the river, where there are great numbers of water-fowl. Here the mountainous country again approaches the river on the left, and a higher saddle mountain is perceived towards the southwest. At a distance of twenty miles from our camp we halted at a village of Wahkiacums, consisting of seven ill-looking houses, built in the same form with those above, and situated at the foot of the high hills on the right, behind two small marshy islands. We merely stopped to purchase some food and two beaver skins, and then proceeded. Opposite to these islands the hills on the left retire, and the river widens into a kind of bay, crowded with low islands, subject to be overflowed occasionally by the tide. We had not gone far from this

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village when, the fog suddenly clearing away, we were at last presented with a glorious sight of the ocean—that ocean, the object of all our labours, the reward of all our anxieties. This animating sight exhilarated the spirits of all the party, who were still more delighted on hearing the distant roar of the breakers. We went on with great cheerfulness along the high mountainous country which bordered the right bank: the shore, however, was so bold and rocky that we could not, until a distance of fourteen miles from the last village, find any spot fit for an encampment. Having made during the day thirty-four miles, we now spread our mats on the ground, and passed the night in the rain. Here we were joined by our small canoe, which had been separated from us during the fog this morning. Two Indians from the last village also accompanied us to the camp; but having detected them in stealing a knife, they were sent off.

*“November 8.* It rained this morning; and, having changed our clothing, which had been wet by yesterday’s rain, we set out at nine o’clock. Immediately opposite our camp was a pillar rock, at the distance of a mile in the river, about twenty feet in diameter and fifty in height, and towards the southwest some high mountains, one of which was covered with snow at the top. We proceeded past several low islands in the bend or bay of the river to the left, which were here five or six miles wide.

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On the right side we passed an old village, and then, at the distance of three miles, entered an inlet or niche, about six miles across, and making a deep bend of nearly five miles into the hills on the right shore, where it receives the waters of several creeks. We coasted along this inlet, which, from its little depth, we called Shallow Bay, and at the bottom of it stopped to dine, near the remains of an old village, from which, however, we kept at a cautious distance, as, like all these places, it was occupied by a plentiful stock of fleas. At this place we observed a number of fowl, among which we killed a goose and two ducks exactly resembling in appearance and flavour the canvas-back duck of the Susquehanna. After dinner we took advantage of the returning tide to go about three miles to a point on the right, eight miles distant from our camp; but here the water ran so high and washed about our canoe so much that several of the men became seasick. It was therefore judged imprudent to proceed in the present state of the weather, and we landed at the point. Our situation here was extremely uncomfortable: the high hills jutted in so closely that there was not room for us to lie level, nor to secure our baggage from the tide, and the water of the river was too salty to be used; but the waves increasing so much that we could not move from the spot with safety, we fixed ourselves on the beach left by the ebb-tide, and, raising the baggage on poles, passed a dis-

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agreeable night, the rain during the day having wet us completely, as, indeed, we had been for some time past.

*November 9.* Fortunately, the tide did not rise as high as our camp during the night; but, being accompanied by high winds from the south, the canoes, which we could not place beyond its reach, were filled with water and saved with much difficulty: our position was exceedingly disagreeable; but, as it was impossible to move from it, we waited for a change of weather. It rained, however, during the whole day, and at two o'clock in the afternoon the flood-tide came in, accompanied by a high wind from the south, which at about four o'clock shifted to the southwest, and blew almost a gale directly from the sea. Immense waves now broke over the place where we were and large trees, some of them five or six feet through, which had been lodged on the point, drifted over our camp, so that the utmost vigilance of every man could scarcely save the canoes from being crushed to pieces. We remained in the water and were drenched with rain during the rest of the day, our only sustenance being some dried fish and the rain water which we caught. Yet, though wet and cold, and some of them sick from using salt water, the men were cheerful and full of anxiety to see more of the ocean. The rain continued all night and the following morning.

*November 10,* the wind lulling and the

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waves not being so high, we loaded our canoes and proceeded. The mountains on the right are here high, covered with timber, chiefly pine, and descend with a bold and rocky shore to the water. We went through a deep niche and several inlets on the right, while on the opposite side was a large bay, above which the hills are close on the river. At the distance of ten miles the wind rose from the northwest, and the waves became so high that we were forced to return two miles for a place where we could unload with safety. Here we landed at the mouth of a small run, and, having placed our baggage on a pile of drifted logs, waited until low water. The river then appearing more calm, we started again; but, after going a mile, found the waters too turbulent for our canoes, and were obliged to put to shore. Here we landed the baggage, and, having placed it on a rock above the reach of the tide, encamped on some drift logs, which formed the only place where we could lie, the hills rising steep over our heads to the height of five hundred feet. All our baggage, as well as ourselves, was thoroughly wet with rain, which did not cease during the day; it continued, indeed, violently through the night, in the course of which the tide reached the logs on which we lay, and set them afloat.

*November 11.* The wind was still high from the southwest, and drove the waves against the shore with great fury; the rain, too, fell in

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torrents, and not only drenched us to the skin, but loosened the stones on the hillsides, so that they came rolling down upon us. In this comfortless condition we remained all day, wet and cold, and with nothing but dried fish to satisfy our hunger; the canoes at the mercy of the waves at one place, the baggage in another, and the men scattered on floating logs, or sheltering themselves in the crevices of the rocks and hillsides. A hunter was despatched in the hope of finding some game; but the hills were so steep, and so covered with undergrowth and fallen timber, that he could not proceed, and was forced to return. About twelve o'clock we were visited by five Indians in a canoe. They came from the opposite side of the river, above where we were, and their language much resembled that of the Wahkiacums: they calling themselves Cathlamahs. In person they were small, ill-made, and badly clothed; though one of them had on a sailor's jacket and pantaloons, which, as he explained by signs, he had received from the whites below the point. We purchased from them thirteen red charr, a fish which we found very excellent. After some time they went on board their boat and crossed the river, which is here five miles wide, through a very heavy sea.

*November 12.* About three o'clock a tremendous gale of wind arose, accompanied with lightning, thunder, and hail; at six it lightened up for a short time, but a violent rain soon

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began and lasted through the day. During the storm one of our boats, secured by being sunk with great quantities of stone, got loose, but, drifting against a rock, was recovered without having received much injury. Our situation now became much more dangerous, for the waves were driven with fury against the rocks and trees, which till now had afforded us refuge: we therefore took advantage of the low tide, and moved about half a mile round a point to a small brook, which we had not observed before on account of the thick bushes and drift-wood which concealed its mouth. Here we were more safe, but still cold and wet; our clothes and bedding rotten as well as wet, our baggage at a distance, and the canoes, our only means of escape from this place, at the mercy of the waves. Still, we continued to enjoy good health, and even had the luxury of feasting on some salmon and three salmon trout which we caught in the brook. Three of the men attempted to go round a point in our small Indian canoe, but the high waves rendered her quite unmanageable, these boats requiring the seamanship of the natives to make them live in so rough a sea.

*November 13.* During the night we had short intervals of fair weather, but it began to rain in the morning and continued through the day. In order to obtain a view of the country below, Captain Clarke followed the course of the brook, and with much fatigue, and after

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walking three miles, ascended the first spur of the mountains. The whole lower country he found covered with almost impenetrable thickets of small pine, with which is mixed a species of plant resembling arrow-wood, twelve or fifteen feet high, with thorny stems, almost interwoven with each other, and scattered among the fern and fallen timber: there is also a red berry, somewhat like the Solomon's seal, which is called by the natives *solmc*, and used as an article of diet. This thick growth rendered travelling almost impossible, and it was rendered still more fatiguing by the abruptness of the mountain, which was so steep as to oblige him to draw himself up by means of the bushes. The timber on the hills is chiefly of a large, tall species of pine, many of the trees eight or ten feet in diameter at the stump, and rising sometimes more than one hundred feet in height. The hail which fell two nights before was still to be seen on the mountains; there was no game, and no marks of any, except some old tracks of elk. The cloudy weather prevented his seeing to any distance, and he therefore returned to camp and sent three men in an Indian canoe to try if they could double the point and find some safer harbour for our boats. At every flood-tide the sea broke in great swells against the rocks and drifted the trees against our establishment, so as to render it very insecure.

*November 14.* It had rained without inter-

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mission during the night and continued to through the day; the wind, too, was very high, and one of our canoes much injured by being driven against the rocks. Five Indians from below came to us in a canoe, and three of them landed, and informed us that they had seen the men sent down yesterday. Fortunately, at this moment one of the men arrived, and told us that these very Indians had stolen his gig and basket; we therefore ordered the two women, who remained in the canoe, to restore them; but this they refused to do till we threatened to shoot them, when they gave back the articles, and we commanded them to leave us. They were of the Wahkiacum nation. The man now informed us that they had gone round the point as far as the high sea would suffer them in the canoe, and then landed; that in the night he had separated from his companions, who had proceeded farther down; and that, at no great distance from where we were, was a beautiful sand beach and a good harbour. Captain Lewis determined to examine more minutely the lower part of the bay, and, embarking in one of the large canoes, was put on shore at the point, whence he proceeded by land with four men, and the canoe returned nearly filled with water.

*November 15.* It continued raining all night, but in the morning the weather became calm and fair. We began, therefore, to prepare for setting out; but before we were ready a high

## Lewis and Clarke Reach the Pacific

wind sprang up from the southeast, and obliged us to remain. The sun shone until one o'clock, and we were thus enabled to dry our bedding and examine our baggage. The rain, which had continued for the last ten days without any interval of more than two hours, had completely wet all our merchandise, spoiled some of our fish, destroyed the robes, and rotted nearly one-half of our few remaining articles of clothing, particularly the leather dresses. About three o'clock the wind fell, and we instantly loaded the canoes, and left the miserable spot to which we had been confined the last six days. On turning the point we came to the sand beach, through which runs a small stream from the hills, at the mouth of which was an ancient village of thirty-six houses, without any inhabitants at the time except fleas. Here we met Shannon, who had been sent back to us by Captain Lewis. The day Shannon left us in the canoe, he and Willard proceeded on till they met a party of twenty Indians, who, not having heard of us, did not know who they were; but they behaved with great civility—so great, indeed, and seemed so anxious that our men should accompany them towards the sea, that their suspicions were aroused, and they declined going. The Indians, however, would not leave them; and the men, becoming confirmed in their suspicions, and fearful, if they went into the woods to sleep, that they would be cut to pieces in the night, thought it best to remain with the Indians: they therefore made

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a fire, and after talking with them to a late hour, laid down with their rifles under their heads. When they awoke they found that the Indians had stolen and concealed their arms; and having demanded them in vain, Shannon seized a club, and was about assaulting one of the Indians whom he suspected to be the thief, when another of them began to load his fowling-piece with the intention of shooting him. He therefore stopped, and explained to them by signs, that if they did not give up the guns, a large party would come down the river before the sun rose to a certain height, and put every one of them to death. Fortunately, Captain Lewis and his party appeared at this very time, and the terrified Indians immediately brought the guns, and five of them came in with Shannon. To these men we declared that, if ever any of their nation stole anything from us, he would be instantly shot. They resided to the north of this place, and spoke a language different from that of the people higher up the river. It was now apparent that the sea was at all times too rough for us to proceed farther down the bay by water: we therefore landed, and, having chosen the best spot we could, made our camp of boards from the old village. We were now comfortably situated; and, being visited by four Wahkiacums with *wappatoo* roots, were enabled to make an agreeable addition to our food.

*November 16.* The morning was clear and pleasant. We therefore put out all our baggage

## Lewis and Clarke Reach the Pacific

to dry, and sent several of our party to hunt. Our camp was in full view of the ocean, on the bay laid down by Vancouver, which we distinguished by the name of Haley's Bay, from a trader who visits the Indians here, and is a great favourite among them. The meridian altitude of this day gave  $46^{\circ} 19' 11.7''$  as our latitude. The wind was strong from the southwest, and the waves were very high, yet the Indians were passing up and down the bay in canoes, and several of them encamped near us. We smoked with them, but, after our recent experience of their thievish disposition, treated them with caution." . . .

"The hunters brought in two deer, a crane, some geese and ducks, and several brant, three of which were white, except a part of the wing, which was black, and they were much larger than the gray brant.

*November 17.* A fair, cool morning, and easterly wind. The tide rises at this place eight feet six inches.

"About one o'clock Captain Lewis returned, after having coasted down Haley's Bay to Cape Disappointment, and some distance to the north, along the seacoast. He was followed by several Chinooks, among whom were the principal chief and his family. They made us a present of a boiled root very much like the common licorice in taste and size, called *culwhamo*; and in return we gave them articles of double its value. We now learned, however, the danger of accepting

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anything from them, since nothing given in payment, even though ten times more valuable, would satisfy them. We were chiefly occupied in hunting, and were able to procure three deer, four brant, and two ducks; and also saw some signs of elk. Captain Clarke now prepared for an excursion down the bay, and accordingly started.

*November 18*, at daylight, accompanied by eleven men, he proceeded along the beach one mile to a point of rocks about forty feet high, where the hills retired, leaving a wide beach and a number of ponds covered with water-fowl, between which and the mountain there was a narrow bottom covered with alder and small balsam trees. Seven miles from the rocks was the entrance from the creek, or rather drain from the pond and hills, where was a cabin of Chinooks. The cabin contained some children and four women. They were taken across the creek in a canoe by two squaws, to each of whom they gave a fish-hook, and then, coasting along the bay, passed at two miles the low bluff of a small hill, below which were the ruins of some old huts, and close to it the remains of a whale. The country was low, open, and marshy, interspersed with some high pine and with a thick undergrowth. Five miles from the creek, they came to a stream, forty yards wide at low water, which they called Chinook River. The hills up this river and towards the bay were not high, but very thickly covered with large pine of several species."

## Lewis and Clarke Reach the Pacific

Proceeding along the shore, they came to a deep bend, appearing to afford a good harbour, and here the natives told them that European vessels usually anchored. About two miles farther on they reached Cape Disappointment, "an elevated circular knob," says the Journal, "rising with a steep ascent one hundred and fifty or one hundred and sixty feet above the water, formed like the whole shore of the bay, as well as of the seacoast, and covered with thick timber on the inner side, but open and grassy on the exposure next the sea. From this cape a high point of land bears south  $20^{\circ}$  west, about twenty-five miles distant. In the range between these two eminences is the opposite point of the bay, a very low ground, which has been variously called Cape Rond by Le Perouse, and Point Adams by Vancouver. The water, for a great distance off the mouth of the river, appears very shallow, and within the mouth, nearest to Point Adams, is a large sand-bar, almost covered at high tide." . . .

*November 19.* In the evening it began to rain, and continued until eleven o'clock. Two hunters were sent out in the morning to kill something for breakfast, and the rest of the party, after drying their blankets, soon followed. At three miles they overtook the hunters, and breakfasted on a small deer which they had been fortunate enough to kill. This, like all those that we saw on the coast, was much darker than our common deer. Their bodies, too, are deeper, their

legs shorter, and their eyes larger. The branches of the horns are similar, but the upper part of the tail is black, from the root to the end, and they do not leap, but jump like a sheep frightened."

Continuing along five miles farther, they reached a point of high land, below which a sandy point extended in a direction north  $10^{\circ}$  west to another high point twenty miles distant. To this they gave the name of Point Lewis. They proceeded four miles farther along the sandy beach to a small pine tree, on which Captain Clarke marked his name, with the year and day, and then set out to return to the camp, where they arrived the following day, having met a large party of Chinooks coming from it.

*November 21.* The morning was cloudy, and from noon till night it rained. The wind, too, was high from the southeast, and the sea so rough that the water reached our camp. Most of the Chinooks returned home, but we were visited in the course of the day by people of different bands in the neighbourhood, among whom were the Chiltz, a nation residing on the seacoast near Point Lewis, and the Clatsops, who live immediately opposite, on the south side of the Columbia. A chief from the grand rapid also came to see us, and we gave him a medal. To each of our visitors we made a present of a small piece of riband, and purchased some cranberries, and some articles of their manufacture, such as mats and household furniture, for all of which we paid high prices."

## THE SOURCES OF THE MISSISSIPPI

BRIGADIER-GENERAL ZEBULON M. PIKE

[During the years 1805, 1806, and 1807 Brigadier-General Pike commanded, by order of the Government of the United States, an expedition to the sources of the Mississippi, through the western part of Louisiana, to the sources of the Arkansas, Kansas, La Platte and Pierre Juan rivers. The extracts which follow are taken from his narrative published in Philadelphia, 1810. An excellent edition, edited with copious notes by Elliott Coues, was published in three volumes by Francis P. Harper, New York, 1895.]

*January 1, 1806.* Passed six very elegant bark canoes on the bank of the river, which had been laid up by the Chipeways; also a camp which we had conceived to have been evacuated about ten days. My interpreter came after me in a great hurry, conjuring me not to go so far ahead, and assured me that the Chipeways, encountering me without an interpreter, party, or flag, would certainly kill me. But, notwithstanding this, I went on several miles farther than usual, in order to make any discoveries that were to be made; conceiving the savages not so barbarous or ferocious as to fire on two men (I had one with me) who were apparently coming into their country, trusting to their generosity; and knowing, that if we met only two or three we were equal to them, I having my

gun and pistols and he his buckshot. Made some extra presents for New Year's day.

*January 2.* Fine, warm day. Discovered fresh signs of Indians. Just as we were encamping at night, my sentinel informed us that some Indians were coming at full speed upon our trail or track. I ordered my men to stand by their guns carefully. They were immediately at my camp, and saluted the flag by a discharge of three pieces, when four Chipeways, one Englishman, and a Frenchman of the North West Company presented themselves. They informed us that some women having discovered our trail gave the alarm, and not knowing but it was their enemies had departed to make a discovery. They had heard of us, and revered our flag. Mr. Grant, the Englishman, had only arrived the day before from Lake de Sable, from which he marched in one day and a half. I presented the Indians with half a deer, which they received thankfully, for they had discovered our fires some days ago, and believing them to be Sioux fires, they dared not leave their camp. They returned home, but Mr. Grant remained all night.

*January 3.* My party marched early, but I returned with Mr. Grant to his establishment on the Red Cedar Lake, having one corporal with me." . . . "After explaining to a Chipeway warrior, called Curly Head, the object of my voyage, and receiving his answer that he would remain tranquil until my return, we ate a good

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breakfast for the country, departed and overtook my sleds just at dusk. Killed one porcupine. Distance sixteen miles.

*January 4.* We made twenty-eight points in the river; broad, good bottom, and of the usual timber. In the night I was awakened by the cry of the sentinel, calling repeatedly to the men; at length he vociferated, "Will you let the lieutenant be burned to death?" This immediately aroused me; at first I seized my arms, but looking round, I saw my tents in flames. The men flew to my assistance, and we tore them down, but not until they were entirely ruined. This, with the loss of my leggins, moccasins, and socks, which I had hung up to dry, was no trivial misfortune in such a country and on such a voyage. But I had reason to thank God that the powder, three small casks of which I had in my tent, did not take fire; if it had, I must certainly have lost all my baggage, if not my life.

*January 5.* Mr. Grant promised to overtake me yesterday, but has not yet arrived. I conceived it would be necessary to attend his motions with careful observation. Distance twenty-seven miles.

*January 6.* Bradley and myself walked up thirty-one points in hopes to discover Lake de Sable; but finding a near cut of twenty yards for ten miles, and being fearful the sleds would miss it, we returned twenty-three points before we found our camp. They had made only eight points. Met two Frenchmen of the North West

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Company with about one hundred and eighty pounds on each of their backs, with rackets [snow-shoes] on; they informed me that Mr. Grant had gone on with the Frenchmen. Snow fell all day, and was three feet deep. Spent a miserable night.

*January 7.* Made but eleven miles, and was then obliged to send ahead and make fires every three miles; notwithstanding which, the cold was so intense that some of the men had their noses, others their fingers, and others their toes, frozen, before they felt the cold sensibly. Very severe day's march.

*January 8.* Conceiving I was at no great distance from Sandy Lake, I left my sleds and with Corporal Bradley took my departure for that place, intending to send him back the same evening. We walked on very briskly until near night, when we met a young Indian, one of those who had visited my camp near Red Cedar Lake. I endeavoured to explain to him that it was my wish to go to Lake de Sable that evening. He returned with me until we came to a trail that led across the woods; this he signified was a near course. I went this course with him, and shortly after found myself at a Chipeway encampment, to which I believed the friendly savage had enticed me with the expectation that I would tarry all night, knowing that it was too late for us to make the lake in good season. But upon our refusing to stay, he put us in the right road. We arrived at the place where the track left the

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Mississippi at dusk, when we traversed about two leagues of a wilderness without any very great difficulty, and at length struck the shore of Lake de Sable, over a branch of which lay our course. The snow having covered the trail made by the Frenchmen who had passed before us with the rackets, I was fearful of losing ourselves on the lake; the consequences of which can only be conceived by those who have been exposed on a lake or naked plain, in a dreary night of January, in latitude  $47^{\circ}$ , and the thermometer below zero. Thinking that we could observe the bank of the other shore, we kept a straight course, and some time after discovered lights, and on our arrival were not a little surprised to find a large stockade. The gate being open, we entered and proceeded to the quarters of Mr. Grant, where we were treated with the utmost hospitality.

*January 9.* Sent away the corporal early, in order that our men should receive assurances of our safety and success. He carried with him a small keg of spirits, a present from Mr. Grant. The establishment of this place was formed twelve years since by the North West Company, and was formerly under the charge of Mr. Charles Brusky. It has attained at present such regularity as to permit the superintendent to live tolerably comfortably. They have horses they procure from Red River from the Indians; they raise plenty of potatoes, catch pike, suckers, pickerel, and white fish in abundance. They have also beaver, deer, and moose; but the pro-

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vision they chiefly depend upon is wild oats, of which they purchase great quantities from the savages, giving at the rate of about one dollar and a half a bushel. But flour, pork, and salt are almost interdicted to persons not principals in the trade. Flour sells at half a dollar, salt at a dollar, pork at eighty cents, sugar at fifty cents, and tea at four dollars and a half a pound. The sugar is obtained from the Indians, and is made from the maple tree.

*January 10.* Mr. Grant accompanied me to the Mississippi, to mark the place for my boats to leave the river. This was the first time I marched on rackets [snowshoes]. I took the course of the Lake River, from its mouth to the lake. Mr. Grant fell through the ice with his rackets on, and could not have got out without assistance.

*January 11.* Remained all day within quarters.

*January 12.* Went out and met my men about sixteen miles. A tree had fallen on one of them and hurt him very much, which induced me to dismiss a sled and put the loading on the others.

*January 13.* After encountering much difficulty we arrived at the establishment of the North West Company on Lake de Sable a little before night. The ice being very bad on the Lake River, owing to the many springs and marshes, one sled fell through. My men had an excellent room furnished them, and were pre-

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sented with potatoes and spirits. Mr. Grant had gone to an Indian lodge to receive his credits.

*January 14.* Crossed the lake to the north side, that I might take an observation; found the latitude  $46^{\circ} 9' 20''$  N. Surveyed that part of the lake. Mr. Grant returned from the Indian lodges. His party brought a quantity of furs and eleven beaver carcasses.

*January 15.* Mr. Grant and myself made the tour of the lake with two men whom I had for attendants. Found it to be much larger than could be imagined at a view. My men sawed stocks for the sleds, which I found it necessary to construct after the manner of the country. On our march, met an Indian coming into the fort; his countenance expressed no little astonishment when I told him who I was and whence I came, for the people of this country acknowledge that the savages hold the Americans in greater veneration than any other white people. They say of us, when alluding to warlike achievements, that "we are neither Frenchmen nor Englishmen, but white Indians."

*January 16.* Laid down Lake de Sable. A young Indian whom I had engaged to go as a guide to Lake Sang Sue arrived from the woods.

*January 17.* Employed in making sleds after the manner of the country. They are made of a single plank turned up at one end like a fiddle head, and the baggage is lashed on in bags and sacks. Two other Indians arrived from the woods. Engaged in writing.

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*January 18.* Busy in preparing my baggage for my departure for Leech Lake and Reading.

*January 19.* Employed as yesterday. Two men of the North West Company arrived from the Fond du Lac Superior with letters; one of which was from their establishment in Athapuscow, and had been since last May on the route. While at this post I ate roasted beavers, dressed in every respect as a pig is usually dressed with us; it was excellent. I could not discern the least taste of Des Bois. I also ate boiled moose's head, which when well boiled I consider equal to the tail of the beaver; in taste and substance they are much alike.

*January 20.* The men, with their sleds, took their departure about two o'clock. Shortly after I followed them. We encamped at the portage between the Mississippi and Leech Lake River. Snow fell in the night.

*January 21.* Snowed in the morning, but crossed about 9 o'clock. I had gone on a few points when I was overtaken by Mr. Grant, who informed me that the sleds could not get along in consequence of water being on the ice; he sent his men forward; we returned and met the sleds, which had scarcely advanced one mile. We unloaded them, sent eight men back to the post, with whatever might be denominated extra articles, but in the hurry sent my salt and ink. Mr. Grant encamped with me and marched early in the morning.

*January 22.* Made a pretty good day's jour-

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ney. My Indian came up about noon. Distance twenty miles.

*January 23.* Marched about eighteen miles. Forgot my thermometer, having hung it on a tree. Sent Boley back five miles for it. My young Indian and myself killed eight partridges; took him to live with me.

*January 24.* At our encampment this night Mr. Grant had encamped on the night of the same day he left me; it was three days' march for us. It was late before the men came up.

*January 25.* Travelled almost all day through the lands and found them much better than usual. Boley lost the Sioux pipe-stem which I had carried along for the purpose of making peace with the Chipeways; I sent him back for it; he did not return until eleven o'clock at night. It was very warm; thawing all day. Distance forty-four points.

*January 26.* I left my party in order to proceed to a house, or lodge, of Mr. Grant's on the Mississippi, where he was to tarry until I overtook him. Took with me an Indian, Boley, and some trifling provision; the Indian and myself marched so fast that we left Boley on the route, about eight miles from the lodge. Met Mr. Grant's men, on their return to Lake de Sable, having evacuated the house this morning, and Mr. Grant having marched for Leech Lake. The Indian and I arrived before sundown. Passed the night very uncomfortably, having nothing to eat, not much wood, nor any blankets.

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The Indian slept sound. I cursed his insensibility, being obliged to content myself over a few coals all night. Boley did not arrive. In the night the Indian mentioned something about his son.

*January 27.* My Indian rose early, mended his moccasins, then expressed by signs something about his son and the Englishmen we met yesterday. Conceiving that he wished to send some message to his family, I suffered him to depart. After his departure I felt the curse of solitude, although he was truly no company. Boley arrived about ten o'clock. He said that he had followed us until some time in the night, when, believing that he could overtake us, he stopped and made a fire, but having no axe to cut wood he was near freezing. He met the Indians, who made him signs to go on. I spent the day in putting my gun in order, and mended my moccasins. Provided plenty of wood, still found it cold, with but one blanket.

*January 28.* Left our encampment at a good hour; unable to find any trail, passed through one of the most dismal cypress swamps I ever saw and struck the Mississippi at a small lake. Observed Mr. Grant's tracks going through it; found his mark of a cut-off (agreed on between us); took it, and proceeded very well until we came to a small lake, where the trail was entirely hid, but after some search on the other side, found it, when we passed through a dismal swamp, on the other side of which we found a

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large lake, at which I was entirely at a loss, no trail to be seen. Struck for a point about three miles off, where we found a Chipeway lodge of one man and five children, and one old woman. They received us with every mark that distinguished their barbarity, such as setting their dogs on us, trying to thrust their hands into our pockets, and so on, but we convinced them that we were not afraid, and let them know that we were Chewockomen (Americans), when they used us more civilly. After we had arranged a camp as well as possible I went into the lodge; they presented me with a plate of dried meat. I ordered Miller to bring about two gills of liquor, which made us all good friends. The old squaw gave me more meat, and offered me tobacco, which, not using, I did not take. I gave her an order upon my corporal for one knife and half a carrot of tobacco. Heaven clothes the lilies and feeds the raven, and the same Almighty Providence protects and preserves these creatures. After I had gone out to my fire, the old man came out and proposed to trade beaver skins for whiskey; meeting with a refusal he left me; when presently the old woman came out with a beaver skin, she also being refused, he again returned to the charge with a quantity of dried meat (this or any other I should have been glad to have had) when I gave him a peremptory refusal; then all further application ceased. It really appeared that with one quart of whiskey I might have bought all they were possessed of.

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Night remarkably cold, was obliged to sit up nearly the whole of it. Suffered much with cold and from want of sleep.

*January 31.* Took my clothes into the Indian's lodge to dress, and was received very coolly, but by giving him a dram (unasked), and his wife a little salt, I received from them directions for my route. Passed the lake or morass, and opened on meadows (through which the Mississippi winds its course) of nearly fifteen miles in length. Took a straight course through them to the head, when I found we had missed the river; made a turn of about two miles and regained it. Passed a fork which I supposed to be Lake Winipie, making the course northwest; the branch we took was on Leech Lake branch, course southwest and west. Passed a very large meadow or prairie, course west, the Mississippi only fifteen yards wide. Encamped about one mile below the traverse of the meadow. Saw a very large animal, which from its leaps I supposed to be a panther; but if so, it was twice as large as those on the lower Mississippi. He evinced some disposition to approach. I lay down (Miller being in the rear) in order to entice him to come near, but he would not. The night remarkably cold. Some spirits, which I had in a small keg, congealed to the consistency of honey.

*February 1.* Left our camp pretty early. Passed a continuous train of prairie, and arrived at Lake Sang Sue at half-past two o'clock.

## The Sources of the Mississippi

I will not attempt to describe my feelings on the accomplishment of my voyage, for this is the main source of the Mississippi. The Lake Winipie branch is navigable from thence to Red Cedar Lake for the distance of five leagues, which is the extremity of the navigation. Crossed the lake twelve miles to the establishment of the North West Company, where we arrived about three o'clock; found all the gates locked, but upon knocking were admitted and received with marked attention and hospitality by Mr. Hugh McGillis. Had a good dish of coffee, biscuit, butter and cheese for supper.

*February 2.* Remained all day within doors. In the evening sent an invitation to Mr. Anderson, who was an agent of Dickson, and also for some young Indians at his house, to come over and breakfast in the morning.

*February 3.* Spent the day in reading Volney's "Egypt," proposing some queries to Mr. Anderson, and preparing my young men to return with a supply of provisions to my party.

*February 4.* Miller departed this morning. Mr. Anderson returned to his quarters. My legs and ankles were so much swelled that I was not able to wear my own clothes, and was obliged to borrow some from Mr. McGillis.

*February 5.* One of Mr. McGillis's clerks had been sent to some Indian lodges, and expected to return in four days, but had now been absent nine. Mr. Grant was despatched, in order to find out what had become of him.

## Masterpieces of Science

*February 6.* My men arrived at the fort about four o'clock. Mr. McGillis asked if I had any objection to his hoisting their flag in compliment to ours. I made none, as I had not yet explained to him my ideas. In making a traverse of the lake some of my men had their ears, some their noses, and others their chins frozen.

*February 7.* Remained within doors, my limbs being still very much swelled. Addressed a letter to Mr. McGillis on the subject of the North West Company's trade in this quarter.

*February 8.* Took the latitude and found it to be  $47^{\circ} 16' 13''$ . Shot with our rifles.

*February 9.* M. McGillis and myself paid a visit to Mr. Anderson, an agent of Mr. Dickson, of the lower Mississippi, who resided at the west end of the lake. Found him eligibly situated as to trade, but his houses bad. I rode in a cariole, for one person, constructed in the following manner: Boards planed smooth, turned up in front about two feet, coming to a point; about two and a half feet wide behind, on which is fixed a box covered with dressed skins painted; this box is open at the top, but covered in front about two-thirds of the length. The horse is fastened between the shafts. The rider wraps himself up in a buffalo robe, sits flat down, having a cushion to lean his back against. Thus accoutred with a fur cap, and so on, he may bid defiance to the wind and weather. Upon our return we found that some

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of the Indians had already returned from the hunting camps; also Monsieur Roussand, the gentleman supposed to have been killed by the Indians. His arrival with Mr. Grant diffused a general satisfaction through the fort.

*February 10.* Hoisted the American flag in the fort. Reading "Shenstone," etc.

*February 11.* The Sweet, Buck, Burnt, and others arrived, all chiefs of note, but the former in particular, a venerable old man. From him I learned that the Sioux occupied this ground when, to use his own phrase, "He was made a man and began to hunt; that they occupied it the year that the French missionaries were killed at the river Pacagama." The Indians flocked in.

*February 12.* Bradley and myself with Mr. McGillis' and two of his men left Leech Lake at 10 o'clock, and arrived at the house of Red Cedar Lake at sunset, a distance of thirty miles. My ankles were very much swelled, and I was very lame. From the entrance of the Mississippi to the strait is called six miles, a southwest course. Thence to the south end, south thirty, east four miles. The bay at the entrance extends nearly east and west six miles. About two and a half from the north side to a large point. This may be called the upper source of the Mississippi, being fifteen miles above little Lake Winipie, and the extent of canoe navigation only two leagues to some of the Hudson's Bay waters.



## MANILA IN 1842

### LIEUTENANT CHARLES WILKES

[During 1838-42 Lieutenant Wilkes commanded an exploring expedition which was the first ever despatched for scientific research by the United States. The instructions given by Congress to the Commander said:— "The expedition is not for conquest, but discovery. Its objects are all peaceful; they are to extend the empire of commerce and science; to diminish the hazards of the ocean, and point out to future navigators a course by which they may avoid dangers and find safety." The narrative of the expedition was published in five volumes in Philadelphia, 1845. The extracts which follow are from Vol. V., chapter VIII. From 1844 to 1874 the Government of the United States published twenty-eight volumes reciting in detail the scientific results of the expedition.]

At daylight, on the 13th of January, 1842, we were again under way, with a light air, and at nine o'clock reached the roadstead, where we anchored in six fathoms of water, with good holding ground.

A number of vessels were lying in the roads, among which were several Americans loading with hemp. There was also a large English East Indiaman, manned by Lascars, whose noise rendered her more like a floating Bedlam than anything else to which I can liken it.

The view of the city and country around Manila partakes both of a Spanish and an Oriental character. The sombre and heavy-looking

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churches with their awkward towers; the long lines of batteries mounted with heavy cannon; the massive houses, with ranges of balconies; and the light and airy cottages, elevated on posts, situated in the luxuriant groves of tropical trees,—all excite desire to become better acquainted with the country.

Manila is situated on an extensive plain, gradually swelling into distant hills, beyond which, again, mountains rise in the background, to the height of several thousand feet. The latter are apparently clothed with vegetation to their summits. The city is in strong contrast to this luxuriant scenery, bearing evident marks of decay, particularly in the churches, whose steeples and tile roofs have a dilapidated look. The site of the city does not appear to have been well chosen, it having apparently been selected entirely for the convenience of commerce, and the communication that the outlet of the lake affords for the batteaux [freight boats] that transport the produce from the shores of the Laguna de Bay to the city.

There are many arms or branches to this stream, which have been converted into canals; and almost any part of Manila may now be reached in a banca [small passage boat].

The canal is generally filled with coasting vessels, batteaux from the lake, and lighters for the discharge of the vessels lying in the roads. The bay of Manila is safe, excepting during the change of the monsoons, when it is subject to

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the typhoons of the China seas, within whose range it lies. These blow at times with much force, and cause great damage. Foreign vessels have, however, kept this anchorage, and rode out these storms in safety; but native as well as Spanish vessels seek at these times the port of Cavite, about three leagues to the southwest, at the entrance of the bay, which is perfectly secure. Here the government dockyard is situated, and this harbour is consequently the resort of the few gunboats and galleys that are stationed here.

The entrance to the canal or river Pasig is three hundred feet wide, and is enclosed between two well-constructed piers, which extend for some distance into the bay. On the end of one of these is the light-house, and on the other a guard-house. The walls of these piers are about four feet above ordinary high water, and include the natural channel of the river, whose current sets out with some force, particularly when the ebb is making in the bay.

The suburbs, or Binondo quarter, contain more inhabitants than the city itself, and is the commercial town. They have all the stir and life incident to a large population actively engaged in trade, and in this respect the contrast with the city proper is great.

The city of Manila is built in the form of a large segment of a circle, having the chord of the segment on the river: the whole is strongly fortified with walls and ditches. The houses are

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substantially built after the fashion of the mother country. Within the walls are the governor's palace, custom-house, treasury, admiralty, several churches, convents, and charitable institutions, a university, and the barracks for the troops; it also contain some public squares, on one of which is a bronze statute of Charles IV.

The city is properly deemed the court residence of these islands; and all those attached to the government, or who wish to be considered as of the higher circle, reside here; but foreigners are not permitted to do so. The houses in the city are generally of stone, plastered, and white or yellow washed on the outside. They are only two stories high, and in consequence cover a large space, being built around a patio or courtyard.

The ground floors are occupied as storehouses, stables, and for porters' lodges. The second story is devoted to the dining halls and sleeping apartments, kitchens, bath-rooms, etc. The bed-rooms have the windows down to the floor, opening on wide balconies, with blinds or shutters. These blinds are constructed with sliding frames, having small squares of two inches filled in with a thin semi-transparent shell, a species of *Placuna*; the fronts of some of the houses have a large number of these small lights, where the females of the family may enjoy themselves unperceived.

After entering the canal, we very soon found

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ourselves among a motley and strange population. On landing, the attention is drawn to the vast number of small stalls and shops with which the streets are lined on each side, and to the crowds of people passing to and fro, all intent upon their several occupations. The artisans in Manila are almost wholly Chinese; and all trades are local, so that in each quarter of the Binondo suburb the privilege of exclusive occupancy is claimed by some particular kinds of shops. In passing up the Escolta (which is the longest and main street in this district), the cabinet-makers, seen busily at work in their shops, are first met with; next to these come the tinkers and blacksmiths; then the shoemakers, clothiers, fishmongers, haberdashers, etc. These are flanked by outdoor occupations; and in each quarter are numerous cooks frying cakes, stewing, etc., in movable kitchens; while here and there are to be seen betel-nut sellers, either moving about to obtain customers, or taking a stand in some great thoroughfare. The moving throng, composed of carriers, waiters, messengers, etc., pass quietly and without any noise: they are generally seen with the Chinese umbrella, painted of many colours, screening themselves from the sun. The whole population wear slippers, and move along with a slipshod gait.

The Chinese are apparently far more numerous than the Malays, and the two races differ as much in character as in appearance: one is

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all activity, while the other is disposed to avoid all exertion. They preserve their distinctive character throughout, mixing but very little with each other, and are removed as far as possible in their civilities; the former, from their industry and perseverance, have almost monopolized all the lucrative employments among the lower orders, excepting the selling of fish and betel-nut, and articles manufactured in the provinces. . . .

Of all her foreign possessions, the Philippines have cost Spain the least blood and labour. The honour of their discovery belongs to Magalhaens, whose name is associated with the straits at the southern extremity of the American continent, but which has no memorial in these islands. Now that the glory which he gained by being the first to penetrate from the Atlantic to the Pacific has been in some measure obliterated by the disuse of those straits by navigators, it would seem due to his memory that some spot among these islands should be set apart to commemorate the name of him who made them known to Europe. This would be but common justice to the discoverer of a region which has been a source of so much honour and profit to the Spanish nation, who opened the vast expanse of the Pacific to the fleets of Europe, and who died fighting to secure the benefits of his enterprise to his king and country.

Few portions of the globe seem to be so much the seat of internal fires, or to exhibit

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the effects of volcanic action so strongly as the Philippines. During our visit, it was not known that any of the volcanoes were in action; but many of them were smoking, particularly that in the district of Albay, called Isaroc. Its latest eruption was in the year 1839; but this did little damage compared with that of 1814, which covered several villages, and the country for a great distance around; with ashes. This mountain is situated to the southeast of Manila one hundred and fifty miles, and is said to be a perfect cone, with a crater at its apex.

It does not appear that the islands are much affected by earthquakes, although some have occasionally occurred that have done damage to the churches at Manila.

The coal found in the Philippines is deemed of value; it has a strong resemblance to the bituminous coal of our own country, possesses a bright lustre, and appears very free from all woody texture when fractured. It is found associated with sandstone, which contains many fossils. Lead and copper are reported as being very abundant; gypsum and limestone occur in some districts. From this it will be seen that these islands have everything in the mineral way to constitute them desirable possessions.

With such mineral resources and a soil capable of producing the most varied vegetation of the tropics, a liberal policy is all that the country lacks. The products of the Philippine Islands consist of sugar, coffee, hemp, indigo,

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rice, tortoise-shell, hides, ebony, saffron-wood, sulphur, cotton, cordage, silk, pepper, cocoa, wax, and many other articles. In their agricultural operations the people are industrious, although much labour is lost by the use of defective implements. The plow, of a very simple construction, has been adopted from the Chinese; it has no coulter, the share is flat, and being turned partly to one side, answers, in a certain degree the purpose of a mould-board. This rude implement is sufficient for the rich soils, where the tillage depends chiefly upon the harrow, in constructing which a thorny species of bamboo is used. The harrow is formed of five or six pieces of this material, on which the thorns are left, firmly fastened together. It answers its purpose well, and is seldom out of order. A wrought-iron harrow, that was introduced by the Jesuits, is used for clearing the ground more effectually, and more particularly for the purpose of extirpating a troublesome grass, that is known by the name of cogon (a species of *Andropogon*), of which it is very difficult to rid the fields. The bolo or long-knife, a basket, a hoe, complete the implements, and answer all the purposes of our spades, etc.

The buffalo was used until within a few years exclusively in their agricultural operations, and they have lately taken to the use of the ox; but horses are never used. The buffalo, from the slowness of his motions, and his exceeding restlessness under the heat of the climate, is

ill adapted to agricultural labour; but the natives are very partial to them, notwithstanding they occasion them much labour and trouble in bathing them during the great heat. This is absolutely necessary, or the animal becomes so fretful as to be unfit for use. If it were not for this, the buffalo would, notwithstanding his slow pace, be most effective in agricultural operations; he requires little food, and that of the coarsest kind; his strength surpasses that of the stoutest ox, and he is admirably adapted for the rice or paddy fields. They are very docile when used by the natives, and even children can manage them; but it said they have a great antipathy to the whites and all strangers. The usual mode of guiding them is by a small cord attached to the cartilage of the nose. The yoke rests on the neck before the shoulders, and is of simple construction. To this is attached whatever it may be necessary to draw, either by traces, shafts, or other fastenings. Frequently these animals may be seen with large bundles of bamboo lashed to them on each side. Buffaloes are to be met with on the lake with no more than their noses and eyes out of the water, and are not visible until they are approached within a few feet, when they cause alarm to the passengers by raising their large forms close to the boat. It is said that they resort to the lake to feed on a favourite grass that grows on its bottom in shallow water, and which they dive for. Their flesh is not

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eaten, except that of the young ones, for it is tough and tasteless. The milk is nutritious, and of a character between that of the goat and cow.

Rice is, perhaps, of their agricultural products, the article upon which the inhabitants of the Philippine Islands most depend for food and profit; of this they have several different varieties, which the natives distinguish by their size and the shape of the grain: the birnambang, lamuyo, malagequit, bontot-cabayo, dumali, quinanda, bolohan, and tangi. The three first are aquatic, the five latter upland varieties. They each have their peculiar uses. The dumali is the early variety; it ripens in three months from planting, from which circumstance it derives its name; it is raised exclusively on the uplands. Although much esteemed, it is not extensively cultivated, as the birds and insects destroy a large part of the crop.

The malagequit is very much prized, and used for making sweet and fancy dishes; it becomes exceedingly glutinous, for which reason it is used in making whitewash, which it is said to cause to become of a brilliant white, and to withstand the weather. This variety is not, however, believed to be wholesome. There is also a variety of this last species which is used as food for horses, and supposed to be a remedy and preventive against worms.

The rice grounds or fields are laid out in squares, and surrounded by embankments, to

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retain the water of the rains or streams. After the rains have fallen in sufficient quantities to saturate the ground, a seed-bed is generally planted in one corner of the field, in which the rice is sown broadcast, about the month of June. The heavy rains take place in August, when the fields are ploughed, and are soon filled with water. The young plants are about this time taken from the seed-bed, their tops and roots trimmed, and then planted in the field by making holes in the ground with the fingers and placing four or five sprouts in each of them; in this tedious labor the poor women are employed, whilst the males are lounging in their houses or in the shade of the trees.

The harvest for the aquatic rice begins in December. It is reaped with small sickles, peculiar to the country, called yatap; to the back of these a small stick is fastened, by which they are held, and the stalk is forced upon it and cut. The spikes of rice are cut with this implement, one by one. In this operation, men, women and children, all take part.

The upland rice requires much more care and labour in its cultivation. The land must be ploughed three or four times, and all the turf and lumps well broken up by the harrow.

During its growth it requires to be weeded two or three times, to keep the weeds from choking the crop. The seed is sown broadcast in May. This kind of rice is harvested in November, and to collect the crop is still more tedious than

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in the other case, for it is always gathered earlier and never reaped, in consequence of the grain not adhering to the ear. If it were gathered in any other way, the loss by transportation on the backs of buffaloes and horses, without any covering to the sheaf, would be so great as to dissipate a great portion of the crop.

After the rice is harvested, there are different modes of treating it. Some of the proprietors take it home, where it is thrown into heaps, and left until it is desirable to separate it from the straw, when it is trodden out by men and women with their bare feet. For this operation they usually receive a fifth part of the rice.

Others stack it in a wet and green state, which subjects it to heat, from which cause the grain contracts a dark colour and an unpleasant taste and smell. The natives, however, impute these defects to the wetness of the season.

The crop of both the low and upland rice is usually from thirty to fifty for one: this on old land; but on that which is newly cleared, or which has never been cultivated, the yield is far beyond this. In some soils of the latter description, it is said that for a chupa (seven cubic inches) planted the yield has been a caban. The former is the two-hundred-and-eighth part of the latter. This is not the only advantage gained in planting rice lands, but the saving of labour is equally great; for all

that is required is to make a hole with the fingers and place three or four grains in it. The upland rice requires but little water, and is never irrigated.

The cultivator in the Philippine Islands is always enabled to secure plenty of manure; for vegetation is so luxuriant that by pulling the weeds and laying them with earth a good stock is quickly obtained with which to cover his fields. Thus, although the growth is so rank as to cause him labour, yet in this hot climate its decay is equally rapid, which tends to make his labours more successful.

Among the important productions of these islands, I have mentioned hemp, although the article called Manila hemp must not be understood to be derived from the plant which produces the common hemp (*Canabis*), being obtained from a species of plantain (*Musa textilis*), called in the Philippines "abaca." This is a native of these islands, and was formerly believed to be found only on Mindanao; but this is not the case, for it is cultivated on the south part of Luzon and all the islands south of it. It grows on high ground, in rich soil, and is propagated by seeds. It resembles the other plants of the tribe of plantains, but its fruit is much smaller, although edible. The fibre is derived from the stem, and the plant attains the height of fifteen or twenty feet. The usual mode of preparing the hemp is to cut off the stem near the ground, before the time or just

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when the fruit is ripe. The stem is then eight or ten feet long below the leaves, where it is again cut. The outer coating of the herbaceous stem is then stripped off, until the fibres or cellular parts are seen, when it undergoes the process of rotting, and after being well dried in houses and sheds, is prepared for market by assorting it, a task which is performed by the women and children. That which is intended for cloth is soaked for an hour or two in weak lime-water prepared from sea-shells, again dried, and put up in bundles. From all the districts in which it grows, it is sent to Manila, which is the only port whence it can legally be exported. It arrives in large bundles, and is packed there by means of a screw-press in compact bales, for shipping, secured by rattan, each weighing two piculs. [A picul is about 140 pounds.]

The best Manila hemp ought to be white, dry, and of a long and fine fibre. This is known at Manila by the name of lupis; the second quality they call bandala.

That which is brought to the United States is principally manufactured in or near Boston, and is the cordage known as "white rope." The cordage manufactured at Manila is, however, very superior to the rope made with us, although the hemp is of the inferior kind. A large quantity is also manufactured into mats.

In the opinion of our botanist, it is not prob-

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able that the plant could be introduced with success into our country, for in the Philippines it is not found north of latitude  $14^{\circ}$  N.

The coffee-plant is well adapted to these islands. A few plants were introduced into the gardens of Manila about fifty years ago, since which time it has been spread all over the island, as is supposed, by the civet-cats, which, after swallowing the seeds, carry them to a distance before they are voided.

The coffee of commerce is obtained here from the wild plant, and is of an excellent quality. Upwards of three thousand five hundred piculs are now exported, of which one-sixth goes to the United States.

The sugar-cane thrives well here. It is planted after the French fashion, by sticking the piece diagonally into the ground. Some, finding the cane has suffered in times of drought, have adopted other modes. It comes to perfection in a year, and they seldom have two crops from the same piece of land, unless the season is very favourable.

There are many kinds of cane cultivated, but that grown in the valley of Pampanga is thought to be the best. It is a small, red variety, from four to five feet high, and not thicker than the thumb. The manufacture of the sugar is rudely conducted; and the whole business, I was told, was in the hands of a few capitalists, who, by making advances, secure the whole crop from those who are employed to bring it

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to market. It is generally brought in moulds of the usual conical shape, called pilones, which are delivered to the purchaser from November to June, and contain each about one hundred and fifty pounds. On their receipt they are placed in large storehouses, where the familiar operation of claying is performed. The estimate for the quantity of sugar from these pilones after this process is about one hundred pounds; it depends upon the care taken in the process.

Of cotton they raise a considerable quantity, and principally of the yellow nankeen. In the province of Ylocos it is cultivated most extensively. The mode of cleaning it of its seed is very rude, by means of a hand-mill, and the expense of cleaning a picul (one hundred and forty pounds) is from five to seven dollars. There have, as far as I have understood, been no endeavours to introduce any cotton-gins from our country.

It will be merely necessary to give the prices at which labourers are paid to show how the compensation is in comparison with that in our country. In the vicinity of Manila, twelve and a half cents per day is the usual wages; this in the provinces falls to six and nine cents. A man with two buffaloes is paid about thirty cents. The amount of labour performed by the latter in a day would be the ploughing of a soane, about two-tenths of an acre. The most profitable way of employing labourers is by the

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task, when, it is said, the natives work well, and are industrious.

The manner in which the sugar and other produce is brought to market at Manila is peculiar, and deserves to be mentioned. In some of the villages the chief men unite to build a vessel, generally a pirogue, in which they embark their produce, under the conduct of a few persons, who go to navigate it, and dispose of the cargo. In due time they make their voyage, and when the accounts are settled, the returns are distributed to each according to his share. Festivities are then held, the saints thanked for their kindness, and blessings invoked for another year. After this is over, the vessel is taken carefully to pieces, and distributed among the owners, to be preserved for the next season.

The profits in the crops, according to estimates, vary from sixty to one hundred per cent.; but it was thought, as a general average, that this was, notwithstanding the great productiveness of the soil, far beyond the usual profits accruing from agricultural operations. In some provinces this estimate would hold good, and probably be exceeded.

Indigo would probably be a lucrative crop, for that raised here is said to be of a quality equal to the best, and the crop is not subject to so many uncertainties as in India: the capital and attention required in vats, etc., prevent it from being raised in any quantities. Among

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the productions, the bamboo and rattan ought to claim a particular notice from their great utility: they enter into almost everything. Of the former their houses are built, including frames, floors, sides, and roof; fences are made of the same material, as well as every article of general household use, including baskets for oil and water. The rattan is a general substitute for ropes of all descriptions, and the two combined are used in constructing rafts for crossing ferries.

The crops frequently suffer from the ravages of the locusts, which sweep all before them. Fortunately for the poorer classes, their attacks take place after the rice has been harvested; but the cane is sometimes entirely cut off. The authorities of Manila, in the vain hope of stopping their devastations, employ persons to gather them and throw them into the sea. I understood on one occasion they had spent eighty thousand dollars in this way, but all to little purpose. It is said that the crops rarely suffer from droughts, but on the contrary the rains are thought to fall too often and to flood the rice fields; these, however, yield a novel crop, and are very advantageous to the poor, viz.: a great quantity of fish, which are called dalag, and are a species of *Blunnius*; they are so plentiful that they are caught with baskets; these fish weigh from a half to two pounds, and some are said to be eighteen inches long; but this is not all; they are said, after a deep

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inundation, to be found even in the vaults of churches.

The Philippines are divided into thirty-one provinces, sixteen of which are on the island of Luzon, and the remainder comprise the other islands of the group and the Ladrões.

The population of the whole group is above three millions, including all tribes of natives, mestizoes, and whites. The latter-named class are but few in number, not exceeding three thousand. The mestizoes were supposed to be about fifteen or twenty thousand; they are distinguished as Spanish and Indian mestizoes. The Chinese have of late years increased to a large number, and it is said that there are forty thousand of them in and around Manila alone. One-half of the whole population belongs to Luzon. The island next to it in number of inhabitants is Panay, which contains about three hundred and thirty thousand. Then come Zebu, Mindanao, Leyte, Samar, and Negros, varying from the above numbers down to fifty thousand. The population is increasing, and it is thought that it doubles itself in seventy years. This rate of increase appears probable, from a comparison of the present population with the estimate made at the beginning of the present century, which shows a growth in forty years of about one million four hundred thousand.

The native population is composed of a number of distinct tribes, the principal of which in

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Luzon are Pangarihan, Ylocos, Cagayan, Tagala, and Pampangan.

The Irogotes, who dwell in the mountains, are the only natives who have not been subjected by the Spaniards. The other tribes have become identified with their rulers in religion, and it is thought that by this circumstance alone has Spain been able to maintain the ascendancy, with so small a number, over such a numerous, intelligent, and energetic race as they are represented to be. This is, however, more easily accounted for, from the Spaniards fostering and keeping alive the jealousy and hatred that existed at the time of the discovery between the different tribes.

It seems almost incredible that Spain should have so long persisted in the policy of allowing no more than one galleon to pass annually between her colonies, and equally so that the nations of Europe should have been so long deceived in regard to the riches and wealth that Spain was monopolizing in the Philippines. The capture of Manila, in 1762, by the English, first gave a clear idea of the value of this remote and little-known appendage of the empire.

The Philippines, considered in their capacity for commerce, are certainly among the most favoured portions of the globe, and there is but one circumstance that tends in the least degree to lessen their apparent advantage; this is the prevalence of typhoons in the China seas, which are occasionally felt with force to

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the north of latitude  $10^{\circ}$  N. South of that parallel they have never been known to prevail, and seldom so far; but from their unfailing occurrence yearly in some part of the China seas, they are looked for with more or less dread, and cause each season a temporary interruption in all the trade that passes along the coast of these islands.

The army is now composed entirely of native troops, who number about six thousand men, and the regiments are never suffered to serve in the provinces in which they are recruited, but those from the north are sent to the south, and vice versa. There they are employed to keep a continual watch on each other; and, speaking different dialects, they never become identified.

They are, indeed, never allowed to remain long enough in one region to imbibe any feelings in unison with those of its inhabitants. The hostility is so great among the regiments that mutinies have occurred, and contests arisen which have produced even bloodshed, which it was entirely out of the power of the officers to prevent. In cases of this kind, summary punishment is resorted to.

Although the Spaniards, as far as is known abroad, live in peace and quiet, this is far from being the case; for rebellion and revolts among the troops and tribes are not unfrequent in the provinces. During the time of our visit one of these took place, but it was impossible

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to learn anything concerning it that could be relied upon, for all conversation respecting such occurrences is interdicted by the government. The difficulty to which I refer was said to have originated from the preaching of a fanatic priest, who inflamed them to such a degree that they overthrew the troops and became temporarily masters of the country. Prompt measures were immediately taken, and orders issued to give the rebels no quarter; the regiments most hostile to those in the revolt were ordered to the spot; they spared no one; the priest and his companions were taken, put to death, and according to report, in a manner so cruel as to be a disgrace to the records of the nineteenth century. Although I should hope the accounts I heard of these transactions were incorrect, yet the detestation these acts were held in would give some colour to the statements.

The few gazettes that are published at Manila are entirely under the control of the government; and a resident of that city must make up his mind to remain in ignorance of the things that are passing around him, or believe just what the authorities will allow to be told, whether truth or falsehood. The government of the Philippines is emphatically an iron rule; how long can it continue so is doubtful.

The natives of the Philippines are industrious. They manufacture an amount of goods sufficient to supply their own wants, particularly

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from Panay and Ylocos. These, for the most part, consist of cotton and silks, and a peculiar article called pina. The latter is manufactured from a species of Bromelia (pine-apple), and comes principally from the island of Panay. The finest kinds of pina are exceedingly beautiful and surpass any other material in its evenness and beauty of texture. Its colour is yellowish, and the embroidery is fully equal to the material. It is much sought after by all strangers, and considered as one of the curiosities of this group. Various reports have been stated of the mode of its manufacture, and among others that it was woven under water, which I found, upon inquiry, to be quite erroneous. The web of the pina is so fine that they are obliged to prevent all currents of air from passing through the rooms where it is manufactured, for which purpose there are gauze screens in the windows. After the article is brought to Manila, it is then embroidered by girls; this last operation adds greatly to its value.

The market is a never-failing place of amusement to a foreigner; for there a crowd of the common people is always to be seen, and their mode of conducting business may be observed. The canals here afford great facilities for bringing vegetables and produce to market in a fresh state. The vegetables are chiefly brought from the shores of the Laguna de Bay, through the river Pasig. The meat appeared inferior, and as in all Spanish places the art of butcher-

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ing is not understood. The poultry, however, surpasses that of any other place I have seen, particularly in ducks, the breeding of which is pursued to a great extent. Establishments for breeding these birds are here carried on in a systematic manner, and are a great curiosity. They consist of many small enclosures, each about twenty feet by forty or fifty, made of bamboo, which are placed on the bank of the river, and partly covered with water. In one corner of the enclosure is a small house, where the eggs are hatched by artificial heat, produced by rice-chaff in a state of fermentation. It is not uncommon to see six or eight hundred ducklings all of the same age. There are several hundreds of these enclosures, and the number of ducks of all ages may be computed at millions. The manner in which they are schooled to take exercise, and to go in and out of the water, and to return to their house, almost exceeds belief. The keepers or tenders are of the Tagala tribe, who live near the enclosures, and have them at all times under their eye. The old birds are not suffered to approach the young, and all of one age are kept together. They are fed upon rice and a small species of shell-fish that is found in the river and is peculiar to it. From the extent of these establishments we inferred that ducks were the favourite article of food at Manila, and the consumption of them must be immense. The markets are well supplied with chickens, pigeons, young partridges, which

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are brought in alive, and turkeys. Among strange articles that we saw for sale were cakes of coagulated blood. The markets are well stocked with a variety of fish, taken both in the Laguna and bay of Manila, affording a supply of both the fresh and salt water species, and many smaller kinds that are dried and smoked. Vegetables are in great plenty, and consist of pumpkins, lettuce, onions, radishes, very long squashes, etc.; of fruits they have melons, chicos, durians, marbolas, and oranges.

Fish are caught in weirs, by the hook, or in seines. The former are constructed of bamboo stakes, in the shallow water of the lake, at the point where it flows through the river Pasig. In the bay, and at the mouth of the river, the fish are taken in nets, suspended by the four corners from hoops attached to a crane, by which they are lowered into the water. The fishing-boats are little better than rafts, and are called saraboas.

The usual passage-boat is termed banca, and is made of a single trunk. These are very much used by the inhabitants. They have a sort of awning to protect the passenger from the rays of the sun; and being light are easily rowed about, although they are exceedingly uncomfortable to sit in, from the lowness of the seats, and liable to upset if the weight is not placed near the bottom. The outrigger has in all probability been dispensed with, owing to the impediment it offered to the navigation of their canals; these canals offer great facilities

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for the transportation of burdens; the banks of almost all of them are faced with granite. Where the streets cross them, there are substantial stone bridges, which are generally of no more than one arch, so as not to impede the navigation. The barges used for the transportation of produce resemble our canal-boats, and have sliding roofs to protect them from the rain.

Water for the supply of vessels is brought off in large earthen jars. It is obtained from the river, and if care is not taken, the water will be impure; it ought to be filled beyond the city. Our supply was obtained five or six miles up the river by a lighter, in which were placed a number of water-casks. It proved excellent.

The country around Manila, though no more than an extended plain for some miles, is one of great interest and beauty, and affords many agreeable rides on the roads to Santa Anna and Maraquino. Most of the country-seats are situated on the river Pasig; they may indeed be called palaces, from their extent and appearance. They are built upon a grand scale, and after the Italian style, with terraces, supported by strong abutments, decked with vases of plants. The grounds are ornamented with the luxuriant, lofty, and graceful trees of the tropics; these are tolerably well kept. Here and there fine large stone churches, with their towers and steeples, are to be seen, the whole giving the impression of a wealthy nobility and a happy and flourishing peasantry.

## THE ASCENT OF MOUNT TYNDALL.

. CLARENCE KING.

[In 1864 Professor Josiah Dwight Whitney, State Geologist of California, sent a band of five explorers for a summer's campaign in the high Sierras. Clarence King was assistant geologist of the party; he recounted their researches and adventures in "Mountaineering in the Sierra Nevada," published in 1871 by J. R. Osgood & Co., Boston; three years later the same firm issued an enlarged edition with maps. "The Ascent of Mount Tyndall," the third chapter of the book, is one of the most thrilling stories of adventure ever written. Clarence King suggested and organized the United States Geological Survey, and was its director 1878-81. He died in 1901.]

MORNING dawned brightly upon our bivouac among a cluster of dark firs in the mountain corridor, opened by an ancient glacier of King's River in the heart of the Sierras. It dawned a trifle sooner than we could have wished, but Professor Brewer and Hoffman had breakfasted before sunrise, and were off with barometer and theodolite upon their shoulders, proposing to ascend our amphitheatre to its head and climb a great pyramidal peak which swelled up against the eastern sky, closing the view in that direction.

We, who remained in camp, spent the day in overhauling campaign materials and preparing for a grand assault upon the summits. For a couple of hours we could descry our friends through the field-glasses, their minute black

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forms moving slowly on among piles of giant débris; now and then lost, again coming into view, and at last disappearing altogether.

It was twilight of evening and almost eight o'clock when they came back to camp, Brewer leading the way, Hoffman following; and as they sat down by our fire without uttering a word we read upon their faces terrible fatigue.

So we hastened to give them supper of coffee and soup, bread and venison, which resulted, after a time, in our getting in return the story of the day.

For eight whole hours they had worked up over granite and snow, mounting ridge after ridge, till the summit was made about two o'clock.

These snowy crests bounding our view at the eastward we had all along taken to be the summits of the Sierra, and Brewer had supposed himself to be climbing a dominant peak, from which he might look eastward over Owen's Valley and out upon leagues of desert. Instead of this a vast wall of mountains, lifted still higher than his peak, rose beyond a tremendous cañon which lay like a trough between the two parallel ranks of peaks. Hoffman showed us on his sketch-book the profile of this new range, and I instantly recognized the peaks which I had seen from Mariposa, whose great white pile had led me to believe them the highest points of California.

For a couple of months my friends had made me the target of plenty of pleasant banter about

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my "highest land," which they lost faith in as we climbed from Thomas's Mill,—I too becoming a trifle anxious about it; but now the truth had burst upon Brewer and Hoffman they could not find words to describe the terribleness and grandeur of the deep cañon, nor for picturing those huge crags towering in line at the east. Their peak, as indicated by the barometer, was in the region of 13,400 feet, and a level across to the farther range showed its crests to be at least 1,500 feet higher. They had spent hours upon the summit scanning the eastern horizon, and ranging downward into the labyrinth of gulfs below, and had come at last with reluctance to the belief that to cross this gorge and ascend the eastern wall of peaks was utterly impossible.

Brewer and Hoffman were old climbers, and their verdict of impossible opposed me as I lay awake thinking about it; but early next morning I had made up my mind, and, taking Cotter aside, I asked him in an easy manner whether he would like to penetrate the Unknown Land with me at the risk of our necks, provided Brewer should consent. In frank, courageous tone he answered after his usual mode, "Why not?" Stout of limb, stronger yet in heart, of iron endurance, and a quiet, unexcited temperament, and, better yet, deeply devoted to me, I felt that Cotter was the one comrade I would choose to face death with, for I believed there was in his manhood no room for fear or shirk.

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It was a trying moment for Brewer when we found him and volunteered to attempt a campaign for the top of California, because he felt a certain fatherly responsibility over our youth, a natural desire that we should not deposit our triturated remains in some undiscoverable hole among the feldspathic granites; but, like a true disciple of science, this was at last overbalanced by his intense desire to know more of the unexplored region. He freely confessed that he believed the plan madness, and Hoffman, too, told us we might as well attempt to get on a cloud as to try the peak.

As Brewer gradually yielded his consent, I saw by his conversation that there was a possibility of success; so we spent the rest of the day in making preparations.

Our walking shoes were in excellent condition, the hobnails firm and new. We laid out a barometer, a compass, a pocket-level, a set of wet and dry thermometers, note-books, with bread, cooked beans, and venison enough to last a week, rolled them all in blankets, making two knapsack-shaped packs strapped firmly together with loops for the arms, which, by Brewer's estimate, weighed forty pounds apiece.

Gardner declared he would accompany us to the summit of the first range to look over into the gulf we were to cross, and at last Brewer and Hoffman also concluded to go up with us.

Quite too early for our profit we all betook ourselves to bed, vainly hoping to get a long refresh-

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ing sleep from which we should rise ready for our tramp.

Never a man welcomed those first gray streaks in the east gladder than I did, unless it may be Cotter, who has in later years confessed that he did not go to sleep that night. Long before sunrise we had done our breakfast and were under way, Hoffman kindly bearing my pack, and Brewer Cotter's.

Our way led due east up the amphitheatre and toward Mount Brewer, as we had named the great pyramidal peak.

Awhile after leaving camp, slant sunlight streamed in among gilded pinnacles along the slope of Mount Brewer, touching here and there, in broad dashes of yellow, the gray walls, which rose sweeping up on either side like the sides of a ship.

Our way along the valley's middle ascended over a number of huge steps, rounded and abrupt, at whose bases were pools of transparent snow-water edged with rude piles of erratic glacier blocks, scattered companies of alpine firs, of red bark and having cypress-like darkness of foliage, with fields of snow under sheltering cliffs, and bits of softest velvet meadow clouded with minute blue and white flowers.

As we climbed, the gorge grew narrow and sharp, both sides wilder; and the spurs which projected from them, nearly overhanging the middle of the valley, towered above us with more and more severe sculpture. We frequently

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crossed deep fields of snow, and at last reached the level of the highest pines, where long slopes of débris swept down from either cliff, meeting in the middle. Over and among these immense blocks, often twenty and thirty feet high, we were obliged to climb, hearing far below us the subterranean gurgle of streams.

Interlocking spurs nearly closed the gorge behind us; our last view was out a granite gateway formed of two nearly vertical precipices, sharp-edged, jutting buttress-like, and plunging down into a field of angular boulders which fill the valley bottom.

The eye ranged out from this open gateway overlooking the great King's Cañon with its moraine-terraced walls, the domes of granite upon Big Meadows, and the undulating stretch of forest which descends to the plain.

The gorge turning southward, we rounded a sort of mountain promontory, which, closing the view behind us, shut us up in the bottom of a perfect basin. In front lay a placid lake reflecting the intense black-blue of the sky. Granite, stained with purple and red, sank into it upon one side, and a broad spotless field of snow came down to its margin on the other.

From a pile of large granite blocks, forty or fifty feet up above the lake margin, we could look down fully a hundred feet through the transparent water to where boulders and pebbles were strewn upon the stone bottom. We had now reached the base of Mount Brewer and were

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skirting its southern spurs in a wide open corridor surrounded in all directions by lofty granite crags from two to four thousand feet high; above the limits of vegetation, rocks, lakes of deep heavenly blue, and white trackless snows were grouped closely about us. Two sounds, a sharp little cry of martens and occasional heavy crashes of falling rock, saluted us.

Climbing became exceedingly difficult, light air—for we had already reached 12,500 feet—beginning to tell on our lungs to such an extent that my friend, who had taken turns with me in carrying my pack, was unable to do so any longer, and I adjusted it to my own shoulders for the rest of the day.

After four hours of slow laborious work we made the base of the débris slope which rose about a thousand feet to a saddle pass in the western mountain wall, that range upon which Mount Brewer is so prominent a point. We were nearly an hour in toiling up this slope over an uncertain footing which gave way at almost every step. At last, when almost at the top, we paused to take breath, and then all walked out upon the crest, laid off our packs, and sat down together upon the summit of the ridge, and for a few minutes not a word was spoken.

The Sierras are here two parallel summit ranges. We were upon the crest of the western range, and looked down into a gulf 5,000 feet deep, sinking from our feet in abrupt cliffs nearly or quite 2,000 feet, whose base plunged into a

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broad field of snow lying steep and smooth for a great distance, but broken near its foot by craggy steps often a thousand feet high.

Vague blue haze obscured the lost depths, hiding details, giving a bottomless distance out of which, like the breath of wind, floated up a faint treble, vibrating upon the senses, yet never clearly heard.

Rising on the other side, cliff above cliff, precipice piled upon precipice, rock over rock, up against sky, towered the most gigantic mountain-wall in America, culminating in a noble pile of gothic-finished granite and enamel-like snow. How grand and inviting looked its white form, its untrodden, unknown crest, so high and pure in the clear strong blue! I looked at it as one contemplating the purpose of his life; and for just one moment I would have rather liked to dodge that purpose, or to have waited, or to have found some excellent reason why I might not go; but all this quickly vanished, leaving a cheerful resolve to go ahead.

From the two opposing mountain-walls singular, thin, knife-blade ridges of stone jutted out, dividing the sides of the gulf into a series of amphitheatres, each one a labyrinth of ice and rock. Piercing thick beds of snow, sprang up knobs and straight isolated spires of rock, mere obelisks curiously carved by frost, their rigid slender forms casting a blue, sharp shadow upon the snow. Embosomed in depressions of ice, or resting on broken ledges, were azure lakes, deeper

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in tone than the sky, which at this altitude, even at midday, has a violet duskiness.

To the south, not more than eight miles, a wall of peaks stood across the gulf, dividing the King's, which flowed north at our feet, from the Kern River, that flowed down the trough in the opposite direction.

I did not wonder that Brewer and Hoffman pronounced our undertaking impossible; but when I looked at Cotter there was such complete bravery in his eye that I asked him if he were ready to start. His old answer, "Why not?," left the initiative with me; so I told Professor Brewer that we would bid him good-bye. Our friends helped us on with our packs in silence, and as we shook hands there was not a dry eye in the party. Before he let go of my hand Professor Brewer asked me for my plan, and I had to own that I had but one, which was to reach the highest peak in the range.

After looking in every direction I was obliged to confess that I saw as yet no practicable way. We bade them a "good-bye," receiving their "God bless you" in return, and started southward along the range to look for some possible cliff to descend. Brewer, Gardner, and Hoffman turned north to push upward to the summit of Mount Brewer, and complete their observations. We saw them whenever we halted, until at last, on the very summit, their microscopic forms were for the last time visible. With very great difficulty we climbed a peak which surmounted

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our wall just to the south of the pass, and, looking over the eastern brink, found that the precipice was still sheer and unbroken. In one place, where the snow lay against it to the very top, we went to its edge and contemplated the slide. About three thousand feet of unbroken white, at a fearfully steep angle, lay below us. We threw a stone over it and watched it bound until it was lost in the distance; after fearful leaps we could only detect it by the flashings of snow where it struck, and as these were in some instances three hundred feet apart, we decided not to launch our own valuable bodies, and the still more precious barometer, after it.

There seemed but one possible way to reach our goal; that was to make our way along the summit of the cross ridge which projected between the two ranges. This divide sprang out from our Mount Brewer wall, about four miles to the south of us. To reach it we must climb up and down over the indented edge of the Mount Brewer wall. In attempting to do this we had a rather lively time scaling a sharp granite needle, where we found our course completely stopped by precipices four and five hundred feet in height. Ahead of us the summit continued to be broken into fantastic pinnacles, leaving us no hope of making our way along it; so we sought the most broken part of the eastern descent, and began to climb down. The heavy knapsacks, besides wearing our shoulders gradually into a black-and-blue state, overbalanced us terribly, and

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kept us in constant danger of pitching headlong. At last, taking them off, Cotter climbed down until he found a resting-place upon a cleft of rock, then I lowered them to him with our lasso, afterwards descending cautiously to his side, taking my turn in pioneering downward, receiving the freight of knapsacks as before. In this manner we consumed more than half the afternoon in descending a thousand feet of broken, precipitous slope; and it was almost sunset when we found ourselves upon fields of level snow which lay white and thick over the whole interior slope of the amphitheatre. The gorge below us seemed utterly impassable. At our backs the Mount Brewer wall either rose in sheer cliffs or in broken, rugged stairway, such as had offered us our descent. From this cruel dilemma the cross divide furnished the only hope, and the sole chance of scaling that was at its junction with the Mount Brewer wall. Toward this point we directed our course, marching wearily over stretches of dense frozen snow, and regions of débris, reaching about sunset the last alcove of the amphitheatre, just at the foot of the Mount Brewer wall. It was evidently impossible for us to attempt to climb it that evening, and we looked about the desolate recesses for a sheltered camping-spot. A high granite wall surrounded us upon three sides, recurring to the southward in long elliptical curves; no part of the summit being less than 2,000 feet above us, the higher crags not infrequently reaching 3,000 feet. A

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single field of snow swept around the base of the rock, and covered the whole amphitheatre, except where a few spikes and rounded masses of granite rose through it, and where two frozen lakes, with their blue ice-disks, broke the monotonous surface. Through the white snow-gate of our amphitheatre, as through a frame, we looked eastward upon the summit group: not a tree, not a vestige of vegetation in sight.—sky, snow, and granite the only elements in this wild picture.

After searching for a shelter we at last found a granite crevice near the margin of one of the frozen lakes,—a sort of shelf just large enough for Cotter and me,—where we hastened to make our bed, having first filled the canteen from a small stream that trickled over the ice, knowing that in a few moments the rapid chill would freeze it. We ate our supper of cold venison and bread, and whittled from the sides of the wooden barometer case shaving enough to warm water for a cup of miserably tepid tea, and then, packing our provisions and instruments away at the head of the shelf, rolled ourselves in our blankets and lay down to enjoy the view.

After such fatiguing exercises the mind has an almost abnormal clearness: whether this is wholly from within, or due to the intensely vitalizing mountain air, I am not sure; probably both contribute to the state of exaltation in which all alpine climbers find themselves. The solid granite gave me a luxurious repose, and I lay

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on the edge of our little rock niche and watched the strange yet brilliant scene.

All the snow of our recess lay in the shadow of the high granite wall to the west, but the Kern divide which curved around us from the south-east was in full light; its broken sky-line, battle-mented and adorned with innumerable rough-hewn spires and pinnacles, was a mass of glowing orange intensely defined against the deep violet sky. At the open end of our horseshoe amphitheatre, to the east, its floor of snow rounded over in a smooth brink, overhanging precipices which sank 2,000 feet into the King's Cañon. Across the gulf rose the whole procession of summit peaks, their lower half rooted in a deep sombre shadow cast by the western wall, the heights bathed in a warm purple haze, in which the irregular marbling of snow burned with a pure crimson light. A few fleecy clouds, dyed fiery orange, drifted slowly eastward across the narrow zone of sky which stretched from summit to summit like a roof. At times the sound of waterfalls, faint and mingled with echoes, floated up through the still air. The snow near by lay in cold ghastly shade, warmed here and there in strange flashes by light reflected downward from drifting clouds. The sombre waste about us; the deep violet vault overhead; those far summits, glowing with reflected rose; the deep impenetrable gloom which filled the gorge, and slowly and with vapour-like stealth climbed the mountain wall, extinguishing the red light, com-

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bined to produce an effect which may not be described; nor can I more than hint at the contrast between the brilliancy of the scene under full light, and the cold, death-like repose which followed when the wan cliffs and pallid snow were all overshadowed with ghostly gray.

A sudden chill enveloped us. Stars in a moment crowded through the dark heaven, flashing with a frosty splendour. The snow congealed, the brooks ceased to flow, and, under the powerful sudden leverage of frost, immense blocks were dislodged all along the mountain summits and came thundering down the slopes, booming upon the ice, dashing wildly upon rocks. Under the lee of our shelf we felt quite safe, but neither Cotter nor I could help being startled, and jumping just a little, as these missiles, weighing often many tons, struck the ledge over our heads and whizzed down the gorge, their stroke resounding fainter and fainter, until at last only a confused echo reached us.

The thermometer at nine o'clock marked twenty degrees above zero. We set the "minimum" and rolled ourselves together for the night. The longer I lay the less I liked that shelf of granite; it grew hard in time, and cold also, my bones seeming to approach actual contact with the chilled rock; moreover, I found that even so vigorous a circulation as mine was not enough to warm up the ledge to anything like a comfortable temperature. A single thickness of blanket is a better mattress than none, but the larger crystals

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of orthoclase, protruding plentifully, punched my back and caused me to revolve on a horizontal axis with precision and accuracy. How I loved Cotter! how I hugged him and got warm, while our backs gradually petrified, till we whirled over and thawed them out together! The slant of that bed was diagonal and excessive; down it we slid till the ice chilled us awake, and we crawled back and chocked ourselves up with bits of granite inserted under my ribs and shoulders. In this pleasant position we got dozing again, and there stole over me a most comfortable ease. The granite softened perceptibly. I was delightfully warm and sank into an industrious slumber which lasted with great soundness until four, when we arose and ate our breakfast of frozen venison.

The thermometer stood at two above zero; everything was frozen tight except the canteen, which we had prudently kept between us all night. Stars still blazed brightly, and the moon, hidden from us by western cliffs, shone in pale reflection upon the rocky heights to the east, which rose, dimly white, up from the impenetrable shadows of the cañon. Silence,—cold, ghastly dimness, in which loomed huge forms,—the biting frostiness of the air, wrought upon our feelings as we shouldered our packs and started with slow pace to climb up the “divide.”

Soon, to our dismay, we found the straps had so chafed our shoulders that the weight gave us great pain, and obliged us to pad them with our

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handkerchiefs and extra socks, which remedy did not wholly relieve us from the constant wearing pain of the heavy load.

Directing our steps southward toward a niche in the wall which bounded us only half a mile distant, we travelled over a continuous snow-field frozen so densely as scarcely to yield at all to our tread, at the same time compressing enough to make that crisp frosty sound which we all used to enjoy even before we knew from the books that it had something to do with the severe name of regelation.

As we advanced, the snow sloped more and more steeply up toward the crags, till by and by it became quite dangerous, causing us to cut steps with Cotter's large bowie-knife,—a slow, tedious operation, requiring patience of a pretty permanent kind. In this way we spent a quiet social hour or so. The sun had not yet reached us, being shut out by the high amphitheatre wall; but its cheerful light reflected downward from a number of higher crags, filling the recess with the brightness of day, and putting out of existence those shadows which so sombrely darkened the earlier hours. To look back when we stopped to rest was to realize our danger,—that smooth, swift slope of ice carrying the eye down a thousand feet to the margin of a frozen mirror of ice; ribs and needles of rocks piercing up through the snow, so closely grouped that, had we fallen, a miracle only might have saved us from being dashed. This led to rather deeper steps, and great-

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er care that our burdens should be held more nearly over the centre of gravity, and a pleasant relief when we got to the top of the snow and sat down on a block of granite to breathe and look up in search of a way up the thousand-foot cliff of broken surface, among the lines of fracture and the galleries winding along the face.

It would have disheartened us to gaze up the hard sheer front of precipices, and search among splintered projections, crevices, shelves, and snow patches for an inviting route, had we not been animated by a faith that the mountains could not defy us.

Choosing what looked like the least impossible way, we started; but, finding it unsafe to work with packs on, resumed the yesterday's plan,—Cotter taking the lead, climbing about fifty feet ahead, and hoisting up the knapsacks and barometer as I tied them to the end of the lasso. Constantly closing up in hopeless difficulty before us, the way opened again and again to our gymnastics, till we stood together on a mere shelf, not more than two feet wide, which led diagonally up the smooth cliff. Edging along in careful steps, our backs flattened upon the granite, we moved slowly to a broad platform, where we stopped for breath.

There was no foothold above us. Looking down over the course we had come, it seemed, and I really believe it was, an impossible descent. for one can climb upward with safety where he cannot downward. To turn back was to give

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up in defeat; and we sat at least half an hour, suggesting all possible routes to the summit, accepting none, and feeling disheartened. About thirty feet directly over our heads was another shelf, which, if we could reach, seemed to offer at least a temporary way upward. On its edge were two or three spikes of granite; whether firmly connected with the cliff, or merely blocks of débris, we could not tell from below. I said to Cotter, I thought of but one possible plan: it was to lasso one of these blocks, and to climb, sailor-fashion, hand over hand, up the rope. In the lasso I had perfect confidence, for I had seen more than one Spanish bull throw his whole weight against it without parting a strand. The shelf was so narrow that throwing the coil of rope was a very difficult undertaking. I tried three times, and Cotter spent five minutes vainly whirling the loop up at the granite spikes. At last I made a lucky throw, and it tightened upon one of the smaller protuberances. I drew the noose close, and very gradually threw my hundred and fifty pounds upon the rope; then Cotter joined me, and, for a moment, we both hung our united weight upon it. Whether the rock moved slightly or whether the lasso stretched a little we were unable to decide; but the trial must be made, and I began to climb slowly. The smooth precipice-face against which my body swung offered no foothold, and the whole climb had therefore to be done by the arms, an effort requiring all one's determination. When about

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half way up I was obliged to rest, and, curling my feet in the rope, managed to relieve my arms for a moment. In this position I could not resist the fascinating temptation of a survey downward.

Straight down, nearly a thousand feet below, at the foot of the rocks, began the snow, whose steep, roof-like slope, exaggerated into an almost vertical angle, curved down in a long white field, broken far away by rocks and polished, round lakes of ice.

Cotter looked up cheerfully and asked how I was making it; to which I answered that I had plenty of wind left. At that moment, when hanging between heaven and earth, it was a deep satisfaction to look down at the wide gulf of desolation beneath, and up to unknown dangers ahead, and feel my nerves cool and unshaken.

A few pulls hand over hand brought me to the edge of the shelf, when, throwing my arm around the granite spike, I swung my body upon the shelf and lay down to rest, shouting to Cotter that I was all right, and that the prospects upward were capital. After a few moments' breathing I looked over the brink and directed my comrade to tie the barometer to the lower end of the lasso, which he did, and that precious instrument was hoisted to my station, and the lasso sent down twice for knapsacks, after which Cotter came up the rope in his very muscular way without once stopping to rest. We took our loads in our hands, swinging the barometer

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over my shoulder, and climbed up a shelf which led in a zig-zag direction upward and to the south, bringing us out at last upon the thin blade of a ridge which connected a short distance above the summit. It was formed of huge blocks, shattered, and ready, at a touch, to fall.

So narrow and sharp was the upper slope, that we dared not walk, but got astride, and worked slowly along with our hands, pushing the knapsacks in advance, now and then holding our breath when loose masses rocked under our weight.

Once upon the summit, a grand view burst upon us. Hastening to step upon the crest of the divide, which was never more than ten feet wide, frequently sharpened to a mere blade, we looked down upon the other side, and were astonished to find we had ascended the gentler slope, and that the rocks fell from our feet in almost vertical precipices for a thousand feet or more. A glance along the summit toward the highest group showed us that any advance in that direction was impossible, for the thin ridge was gashed down in notches three or four hundred feet deep, forming a procession of pillars, obelisks, and blocks piled upon each other, and looking terribly insecure.

We then deposited our knapsacks in a safe place, and, finding that it was already noon, determined to rest a little while and take a lunch at over 13,000 feet above the sea.

West of us stretched the Mount Brewer wall

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with its succession of smooth precipices and amphitheatre ridges. To the north the great gorge of the King's River yawned down 5,000 feet. To the south, the valley of the Kern, opening in the opposite direction, was broader, less deep, but more filled with broken masses of granite. Clustered about the foot of the divide were a dozen alpine lakes; the higher ones blue sheets of ice, the lowest completely melted. Still lower in the depths of the two cañons we could see groups of forest trees; but they were so dim and so distant as never to relieve the prevalent masses of rock and snow. Our divide cast its shadow for a mile down King's Cañon in dark-blue profile upon the broad sheets of sunny snow, from whose brightness the hard splintered cliffs caught reflections and wore an aspect of joy. Thousands of rills poured from the melting snow, filling the air with a musical tinkle as of many accordant bells. The Kern Valley opened below us with its smooth oval outline, the work of extinct glaciers, whose form and extent were evident from worn cliff surface and rounded wall; snow-fields, relics of the former *neve* [glacier snow] hung in white tapestries around its ancient birth-place; and, as far as we could see, the broad, corrugated valley, for a breadth of fully ten miles, shone with burnishings wherever its granite surface was not covered with lakelets or thickets of alpine vegetation.

Through a deep cut in the Mount Brewer wall we gained our first view to the westward, and

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saw in the distance the wall of the South King's Cañon, and the granite point which Cotter and I had climbed a fortnight before. But for the haze we might have seen the plain; for above its farther limit were several points of the Coast Ranges, isolated like islands in the sea.

The view was so grand, the mountain colours so brilliant, immense snow-fields and blue alpine lakes so charming, that we almost forgot we were ever to move, and it was only after a swift hour of this delight that we began to consider our future course.

The King's Cañon, which headed against our wall, seemed untraversable,—no human being could climb along the divide; we had then but one hope of reaching the peak, and our greatest difficulty lay at the start. If we could climb down to the Kern side of the divide, and succeed in reaching the base of the precipices which fell from our feet, it really looked as if we might travel without difficulty among the rocks to the other side of the Kern Valley, and make our attempt upon the southward flank of the great peak. One look at the sublime white giant decided us. We looked down over the precipice, and at first could see no method of descent. Then we went back and looked at the road we had come up, to see if that were not possibly as bad; but the broken surface of the rocks was evidently much better climbing-ground than anything ahead of us. Cotter, with danger, edged his way along the wall to the east, and I to the west, to see if there

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might not be some favourable point; but we both returned with the belief that the precipice in front of us was as passable as any of it. Down it we must.

After lying on our faces, looking over the brink ten or twenty minutes, I suggested that by lowering ourselves on the rope we might climb from crevice to crevice; but we saw no shelf large enough for ourselves and the knapsacks too. However, we were not going to give it up without a trial; and I made the rope fast around my breast and, looping the noose over a firm point of rock, let myself slide gradually down to a notch forty feet below. There was only room beside me for Cotter, so I had him send down the knapsacks first. I then tied these together by the straps with my silk handkerchiefs, and hung them as far to the left as I could reach without losing my balance, looping the handkerchiefs over a point of rock. Cotter then slid down the rope, and, with considerable difficulty, we whipped the noose off its resting-place above, and cut off our connection with the upper world.

"We're in for it now, King," remarked my comrade, as he looked aloft, and then down; but our blood was up, and danger added only an exhilarating thrill to the nerves.

The shelf was hardly more than two feet wide, and the granite so smooth that we could find no place to fasten the lasso for the next descent; so I determined to try the climb with only as little aid as possible. Tying it round my breast

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again, I gave the other end into Cotter's hands, and he, bracing his back against the cliff, found for himself as firm a foothold as he could, and promised to give me all the help in his power. I made up my mind to bear no weight unless it was absolutely necessary; and for the first ten feet I found cracks and protuberances enough to support me, making every square inch of surface do friction duty, and hugging myself against the rocks as tightly as I could. When within about eight feet of the next shelf, I twisted myself round upon the face, hanging by two rough blocks of protruding feldspar, and looked vainly for some further hand-hold; but the rock, besides being perfectly smooth, overhung slightly, and my legs dangled in the air. I saw that the next cleft was over three feet broad, and I thought, possibly, I might, by a quick slide, reach it in safety without endangering Cotter. I shouted to him to be very careful and let go in case I fell, loosened my hold upon the rope, and slid quickly down. My shoulder struck against the rock and threw me out of balance; for an instant I reeled over upon the verge, in danger of falling, but, in the excitement, I thrust out my hand and seized a small alpine gooseberry bush, the first piece of vegetation we had seen. Its roots were so firmly fixed in the crevice that it held my weight and saved me.

I could no longer see Cotter, but I talked to him, and heard the two knapsacks come bumping along until they slid over the eaves above me,

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and swung down to my station, when I seized the lasso's end and braced myself as well as possible, intending, if he slipped, to haul in slack and help him as best I might. As he came slowly down from crack to crack, I heard his hobnailed shoes grating on the granite; presently they appeared dangling from the eaves above my head. I had gathered in the rope until it was taut, and then hurriedly told him to drop. He hesitated a moment and let go. Before he struck the rock I had him by the shoulder, and whirled him down upon his side, thus preventing his rolling overboard, which friendly action he took quite coolly.

The third descent was not a difficult one, nor the fourth; but when we had climbed down about two hundred and fifty feet the rocks were so glacially polished and water-worn that it seemed impossible to get any farther. To our right was a crack penetrating the rock perhaps a foot deep, widening at the surface to three or four inches, which proved to be the only possible ladder. As the chances seemed rather desperate, we concluded to tie ourselves together, in order to share a common fate; and with a slack of thirty feet between us, and our knapsacks upon our backs, we climbed into the crevice, and began descending with our faces to the cliff. This had to be done with unusual caution, for the foothold was about as good as none, and our fingers slipped annoyingly on the smooth stone; besides the knapsacks and instruments kept a steady back-

ward pull, tending to overbalance us. But we took pains to descend one at a time, and rest wherever the niches gave our feet a safe support. In this way we got down about eighty feet of smooth, nearly vertical wall, reaching the top of a rude granite stairway, which led to the snow; and here we sat down to rest, and found to our astonishment that we had been three hours from the summit.

After breathing a half-minute we continued down, jumping from rock to rock, and, having by practice become very expert in balancing ourselves, sprang on, never resting long enough to lose equilibrium, and in this manner made a quick descent over rugged débris to the crest of a snow-field, which, for seven or eight hundred feet more, swept down in a smooth, even slope, of very high angle, to the borders of a frozen lake.

Without untying the lasso which bound us together, we sprang upon the snow with a shout, and slid down splendidly, turning now and then a somersault, and shooting out like cannon-balls almost to the middle of the frozen lake; I upon my back, and Cotter feet first, in a swimming position. The ice cracked in all directions. It was only a thin, transparent film, through which we could see deep into the lake. Untying ourselves, we hurried ashore in different directions, lest our combined weight should be too great a strain upon any point.

With curiosity and wonder we scanned every

## The Ascent of Mount Tyndall

shelf and niche of the last descent. It seemed quite impossible that we could have come down there, and now it actually was beyond human power to get back again. But what cared we? "Sufficient unto the day"— We were bound for that still distant, though gradually nearing, summit; and we had come from a cold shadowed cliff into deliciously warm sunshine, and were jolly, shouting, singing songs, and calling out the companionship of a hundred echoes. Six miles away, with no grave danger, no great difficulty, between us, lay the base of our grand mountain. Upon its skirts we saw a little grove of pines, an ideal bivouac, and toward this we bent our course.

After the continued climbing of the day, walking was a delicious rest, and forward we pressed with considerable speed, our hobnails giving us firm footing on the glittering glacial surface. Every fluting of the great valley was in itself a considerable cañon, into which we descended, climbing down the scored rocks, and swinging from block to block, until we reached the level of the pines. Here, sheltered among loose rocks, began to appear little fields of alpine grass, pale yet sunny, soft under our feet, fragrantly jewelled with flowers of fairy delicacy, holding up amid thickly clustered blades chalices of turquoise and amethyst, white stars, and fiery little globes of red. Lakelets, small but innumerable, were held in glacial basins, the scorings and grooves of that old dragon's track ornamenting their smooth bottoms.

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One of these, a sheet of pure beryl hue, gave us as much pleasure from its lovely transparency, and because we lay down in the necklace of grass about it and smelled flowers, while tired muscles relaxed upon warm beds of verdure, and the pain in our burdened shoulders went away, leaving us delightfully comfortable.

After the stern grandeur of granite and ice, and with the peaks and walls still in view, it was relief to find ourselves again in the region of life. I never felt for trees and flowers such a sense of intimate relationship and sympathy. When we had no longer excuse for resting, I invented the palpable subterfuge of measuring the altitude of the spot, since the few clumps of low, wide-boughed pines near by were the highest living trees. So we lay longer with less and less will to rise, and when resolution called us to our feet the getting up was sorely like Rip Van Winkle's in the third act.

The deep glacial cañon-flutings across which our march then lay proved to be great consumers of time; indeed it was sunset when we reached the eastern ascent, and began to toil up through scattered pines, and over trains of moraine [glacial] rocks, toward the great peak. Stars were already flashing brilliantly in the sky, and the low glowing arch in the west had almost vanished when we reached the upper trees, and threw down our knapsacks to camp. The forest grew on a sort of plateau-shelf with a precipitous front to the west,—a level surface which stretched east-

## The Ascent of Mount Tyndall

ward and back to the foot of our mountain, whose lower spurs reached within a mile of camp. Within the shelter lay a huge fallen log, like all these alpine woods one mass of resin, which flared up when we applied a match, illuminating the whole grove. By contrast with the darkness outside, we seemed to be in a vast, many-pillared hall. The stream close by afforded water for our blessed teapot; venison frizzled with mild, appetizing sound upon the ends of pine sticks; matchless beans allowed themselves to become seductively crisp upon our tin plates. That supper seemed to me then the quintessence of gastronomy, and I am sure Cotter and I must have said some very good after-dinner things, though I long ago forgot them all. Within the ring of warmth, on elastic beds of pine-needles, we curled up, and fell swiftly into a sound sleep.

I woke up once in the night to look at my watch, and observed that the sky was overcast with a thin film of cirrus cloud to which the reflected moonlight lent the appearance of a glimmering tint, stretched from mountain to mountain over cañons filled with impenetrable darkness, only the vaguely-lighted peaks and white snow-fields distinctly seen. I closed my eyes and slept soundly until Cotter awoke me at half-past three, when we arose, breakfasted by the light of our fire, which still blazed brilliantly, and, leaving our knapsacks, started for the mountain with only instruments, canteens, and luncheon.

In the indistinct moonlight climbing was very

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difficult at first, for we had to thread our way along a plain which was literally covered with glacier boulders, and the innumerable brooks which we crossed were frozen solid. However, our march brought us to the base of the great mountain, which, rising high against the east, shut out the coming daylight, and kept us in profound shadow. From base to summit rose a series of broken crags, lifting themselves from a general slope of *débris*. Toward the left the angle seemed to be rather gentler, and the surface less ragged; and we hoped, by a long *détour* round the base, to make an easy climb up this gentler surface. So we toiled on for an hour over the rocks, reaching at last the bottom of the north slope. Here our work began in good earnest. The blocks were of enormous size, and in every stage of unstable equilibrium, frequently rolling over as we jumped upon them, making it necessary for us to take a second leap and land where we best could. To our relief we soon surmounted the largest blocks, reaching a smaller size, which served us as a sort of stairway.

The advancing daylight revealed to us a very long, comparatively even snow-slope, whose surface was pierced by many knobs and granite heads, giving it the aspect of a nice-roofing fastened on with bolts of stone. It stretched in far perspective to the summit, where already the rose of sunrise reflected gloriously, kindling a fresh enthusiasm within us.

Immense boulders were partly imbedded in the

## The Ascent of Mount Tyndall

ice just above us, whose constant melting left them trembling on the edge of a fall. It communicated no very pleasant sensation to see above you these immense missiles hanging by a mere band, and knowing that, as soon as the sun rose, you would be exposed to a constant cannonade.

The east side of the peak, which we could now partially see, was too precipitous to think of climbing. The slope toward our camp was too much broken into pinnacles and crags to offer us any hope, or to divert us from the single way, dead ahead, up slopes of ice and among fragments of granite. The sun rose upon us while we were climbing the lower part of this snow, and in less than half an hour, melting began to liberate huge blocks, which thundered down past us, gathering and growing into small avalanches below.

We did not dare climb one above another, according to our ordinary mode, but kept about an equal level, a hundred feet apart, lest, dislodging the blocks, one should hurl them down upon the other.

We climbed alternately up smooth faces of granite, clinging simply by the cracks and protruding crystals of feldspar, and then hewed steps up fearfully steep slopes of ice, zigzagging to the right and left to avoid the flying boulders. When midway up this slope we reached a place where the granite rose in perfectly smooth bluffs on either side of a gorge,—a narrow cut, or walled way, leading up to the flat summit of the cliff. This we scaled by cutting ice steps, only to find

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ourselves fronted again by a still higher wall. Ice sloped from its front at too steep an angle for us to follow, but had melted in contact with it, leaving a space three feet wide between the ice and the rock. We entered this crevice and climbed along its bottom, with a wall of rock rising a hundred feet above us on one side, and a thirty-foot face of ice on the other, through which light of an intense cobalt-blue penetrated.

Reaching the upper end, we had to cut our footsteps upon the ice again, and, having braced our backs against the granite, climb up to the surface. We were now in a dangerous position: to fall into the crevice upon one side was to be wedged to death between rock and ice; to make a slip was to be shot down five hundred feet, and then hurled over the brink of a precipice. In the friendly seat which this wedge gave me, I stopped to take wet and dry observations with the thermometer,—this being an absolute preventive of a scare,—and to enjoy the view.

The wall of our mountain sank abruptly to the left, opening for the first time an outlook to the eastward. Deep—it seemed almost vertically—beneath us we could see the blue waters of Owen's Lake, 10,000 feet below. The summit peaks to the north were piled up in titanic confusion, their ridges overhanging the eastern slope with terrible abruptness. Clustered upon the shelves and plateaus below were several frozen lakes, and in all directions swept magnificent fields of snow. The summit was now not over five hundred feet

## The Ascent of Mount Tyndall

distant, and we started on again with the exhilarating hope of success. But if Nature had intended to secure the summit from all assailants, she could not have planned her defences better; for the smooth granite wall which rose above the snow-slope continued, apparently, quite round the peak, and we looked in great anxiety to see if there was not one place where it might be climbed. It was all blank except in one place; quite near us the snow bridged across the crevice, and rose in a long point to the summit of the wall, —a great icicle-column frozen in a niche of the bluff,—its base about ten feet wide, narrowing to two feet at the top. We climbed to the base of this spire of ice, and, with the utmost care, began to cut our stairway. The material was an exceedingly compacted snow, passing into clear ice as it neared the rock. We climbed the first half of it with comparative ease; after that it was almost vertical, and so thin that we did not dare to cut the footsteps deep enough to make them absolutely safe. There was a constant dread lest our ladder should break off, and we be thrown either down the snow-slope or into the bottom of the crevasse. At last, in order to prevent myself from falling over backwards, I was obliged to thrust my hand into the crack between the ice and the wall, and the spire became so narrow that I could do this on both sides; so that the climb was made as upon a tree, cutting mere toe-holes and embracing the whole column of ice in my arms. At last I reached the top, and, with

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the greatest caution, wormed my body over the brink, and rolling out upon the smooth surface of the granite, looked over and watched Cotter make his climb. He came up steadily, with no sense of nervousness, until he got to the narrow part of the ice, and here he stopped and looked up with a forlorn face to me; but as he climbed up over the ledge the broad smile came back to his face, and he asked me if it had occurred to me that we had, by and by, to go down again.

We had now an easy slope to the summit, and hurried up over rocks and ice, reaching the crest at exactly twelve o'clock. I rang my hammer upon the topmost rock; we grasped hands, and I reverently named the grand peak MOUNT TYN-DALL.

## THE GRAND CANON OF THE COLORADO

MAJOR JOHN WESLEY POWELL

[In 1869-72 Major John Wesley Powell was the chief of a party which explored the Colorado River of the West and its tributaries. The chapter subjoined is from his official report, published by the Government Printing Office, Washington, 1875. The substance of that report, with much additional matter of great interest, appears in "The Cañons of the Colorado," by Major Powell, published by Flood & Vincent, Meadville, Pa., 1895, with superb illustrations. For fourteen years, beginning with 1880, Major Powell was director of the United States Geological Survey; since 1879 he has been director of the United States Bureau of Ethnology.]

*August 13, 1869.* We are now ready to start on our way down the Great Unknown. Our boats, tied to a common stake, are chafing each other, as they are tossed by the fretful river. They ride high and buoyant, for their loads are lighter than we could desire. We have but a month's rations remaining. The flour has been resifted through the mosquito net sieve; the spoiled bacon has been dried, and the worst of it boiled; the few pounds of dried apples have been spread in the sun, and re-shrunk to their normal bulk; the sugar has all melted, and gone on its way down the river; but we have a large sack of coffee. The lightening of the boats has this advantage: they will ride

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the waves better, and we shall have but little to carry when we make a portage.

We are three-quarters of a mile in the depths of the earth, and the great river shrinks into insignificance, as it dashes its angry waves against the walls and cliffs, that rise to the world above; they are but puny ripples, and we but pigmies, running up and down the sands, or lost among the boulders.

We have an unknown distance yet to run; an unknown river yet to explore. What falls there are, we know not; what rocks beset the channel, we know not; what walls rise over the river, we know not. Ah, well! we may conjecture many things. The men talk as cheerfully as ever; jests are bandied out freely this morning; but to me the cheer is sombre and the jests are ghastly.

With some eagerness, and some anxiety, and some misgiving, we enter the cañon below, and are carried along by the swift water through walls which rise from its very edge. They have the same structure as we noticed yesterday—tiers of irregular shelves below, and, above these, steep slopes to the foot of marble cliffs. We run six miles in a little more than half an hour, and emerge into a more open portion of the cañon, where high hills and ledges of rock intervene between the river and the distant walls. Just at the head of this open place the river runs across a dike; that is, a fissure in the rocks, open to depths below, has been

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filled with eruptive matter, and this, on cooling, was harder than the rocks through which the crevice was made, and, when these were washed away, the harder volcanic matter remained as a wall, and the river has cut a gateway through it several hundred feet high, and as many wide. As it crosses the wall, there is a fall below, and a bad rapid, filled with boulders of trap; so we stop to make a portage. Then on we go, gliding by hills and ledges, with distant walls in view; sweeping past sharp angles of rock; stopping at a few points to examine rapids, which we find can be run, until we have made another five miles, when we land for dinner.

Then we let down with lines, over a long rapid, and start again. Once more the walls close in, and we find ourselves in a narrow gorge, the water again filling the channel, and very swift. With great care and constant watchfulness we proceed, making about four miles this afternoon, and camp in a cave.

*August 14.* At daybreak we walk down the bank of the river, on a little sandy beach, to take a view of a new feature in the cañon. Heretofore hard rocks have given us bad river; soft rocks, smooth water; and a series of rocks harder than any we have experienced sets in. The river enters the granite!\*

\* Geologists would call these rocks metamorphic crystalline schists, with dikes and beds of granite, but we will use the popular name for the whole series—granite.

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We can see but a little way into the granite gorge, but it looks threatening.

After breakfast we enter on the waves. At the very introduction, it inspires awe. The cañon is narrower than we have ever before seen it; the water is swifter; there are but few broken rocks in the channel; but the walls are set, on either side, with pinnacles and crags; and sharp, angular buttresses, bristling with wind and wave-polished spires, extend far out into the river.

Ledges of rock jut into the stream, their tops just below the surface, sometimes rising few or many feet above; and island ledges, and island pinnacles, and island towers break the swift course of the stream into chutes, and eddies, and whirlpools. We soon reach a place where a creek comes in from the left, and just below the channel is choked with boulders, which have washed down this lateral cañon and formed a dam, over which there is a fall of thirty or forty feet; but on the boulders we can get foothold, and we make a portage.

Three more such dams are found. Over one we make a portage; at the other two we find chutes, through which we can run.

As we proceed, the granite rises higher, until nearly a thousand feet of the lower part of the walls are composed of this rock.

About eleven o'clock we hear a great roar ahead, and approach it very cautiously. The sound grows louder and louder as we run, and at last we find ourselves above a long, broken fall,

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with ledges and pinnacles of rock obstructing the river. There is a descent of, perhaps, seventy-five or eighty feet in a third of a mile, and the rushing waters break into great waves on the rocks, and lash themselves into a mad, white foam. We can land just above, but there is no foothold on either side by which we can make a portage. It is nearly a thousand feet to the top of the granite, so it will be impossible to carry our boats around, though we can climb to the summit up a side gulch, and, passing along a mile or two, can descend to the river. This we find on examination; but such a portage would be impracticable for us, and we must run the rapid, or abandon the river. There is no hesitation. We step into our boats, push off, and away we go, first on smooth but swift water, then we strike a glassy wave, and ride to its top, down again into the trough, up again on a higher wave, and down and up on waves higher and still higher, until we strike one just as it curls back, and a breaker rolls over our little boat. Still, on we speed, shooting past projecting rocks, till the little boat is caught in a whirlpool, and spun around several times. At last we pull out again into the stream, and now the other boats have passed us. The open compartment of the *Emma Dean* is filled with water, and every breaker rolls over us. Hurlled back from a rock, now on this side, now on that, we are carried into an eddy, in which we struggle for a few minutes, and are then out again, the breakers still rolling over us. Our boat is

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unmanageable, but she cannot sink, and we drift down another hundred yards, through breakers; how, we scarcely know. We find the other boats have turned into an eddy at the foot of the fall, and are waiting to catch us as we come, for the men have seen that our boat is swamped. They push out as we come near, and pull us in against the wall. We bail our boat, and on we go again.

The walls, now, are more than a mile in height—a vertical distance difficult to appreciate. Stand on the south steps of the Treasury Building, in Washington, and look down Pennsylvania Avenue to the Capitol Park, and measure this distance overhead, and imagine cliffs to extend to that altitude, and you will understand what I mean; or, stand at Canal Street, in New York, and look up Broadway to Grace Church, and you have about the distance; or, stand at Lake Street Bridge in Chicago, and look down to the Central Depot, and you have it again.

A thousand feet of this is up through granite crags, then steep slopes and perpendicular cliffs rise, one above another, to the summit. The gorge is black and narrow below, red and gray and flaring above, with crags and angular projections on the walls, which, cut in many places by side cañons, seem to be a vast wilderness of rocks. Down in these grand, gloomy depths we glide, ever listening, for the mad waters keep up their roar; ever watching, ever peering ahead, for the narrow cañon is winding, and the river is closed in so that we can see but a few hundred

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yards, and what there may be below we know not; but we listen for falls, and watch for rocks, or stop now and then, in the bay of a recess, to admire the gigantic scenery. And ever, as we go, there is some new pinnacle or tower, some crag or peak, some distant view of the upper plateau, some strange-shaped rock, or some deep, narrow side cañon. Then we come to another broken fall, which appears more difficult than the one we ran this morning.

A small creek comes in on the right, and the first fall of the water is over boulders, which have been carried down by this lateral stream. We land at its mouth, and stop for an hour or two to examine the fall. It seems possible to let down with lines, at least a part of the way, from point to point, along the right-hand wall. So we make a portage over the first rocks, and find footing on some boulders below. Then we let down one of the boats to the end of her line, when she reaches a corner of the projecting rock, to which one of the men clings, and steadies her, while I examine an eddy below. I think we can pass the other boats down by us, and catch them in the eddy. This is soon done and the men in the boats in the eddy pull us to their side. On the shore of this little eddy there is about two feet of gravel beach above the water. Standing on this beach, some of the men take the line of the little boat and let it drift down against another projecting angle. Here is a little shelf, on which a man from my boat climbs, and a shorter line is passed to him, and

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he fastens the boat to the side of the cliff. Then the second one is let down, bringing the line of the third. When the second boat is tied up, the two men standing on the beach above spring into the last boat, which is pulled up alongside of ours. Then we let down the boats, for twenty-five or thirty yards, by walking along the shelf, landing them again in the mouth of a side cañon. Just below this there is another pile of boulders, over which we make another portage. From the foot of these rocks we can climb to another shelf, forty or fifty feet above the water.

On this beach we camp for the night. We find a few sticks, which have lodged in the rocks. It is raining hard, and we have no shelter, but kindle a fire and have our supper. We sit on the rocks all night, wrapped in our ponchos, getting what sleep we can.

*August 15.* This morning we find we can let down for three or four hundred yards, and it is managed in this way: We pass along the wall by climbing from projecting point to point, sometimes near the water's edge, at other places fifty or sixty feet above, and hold the boat with a line, while two men remain aboard, and prevent her from being dashed against the rocks, and keep the line from getting caught in the wall. In two hours we have brought them all down, as far as it is possible, in this way. A few yards below, the river strikes with great violence against a projecting rock, and our boats are pulled up in a little bay above. We must now manage to pull out of

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this, and clear the point below. The little boat is held by the bow obliquely up the stream. We jump in, and pull out only a few strokes, and sweep clear of the dangerous rock. The other boats follow in the same manner, and the rapid is passed.

It is not easy to describe the labour of such navigation. We must prevent the waves from dashing the boats against the cliffs. Sometimes, where the river is swift, we must put a bight of rope about a rock, to prevent her being snatched from us by a wave; but where the plunge is too great, or the chute too swift, we must let her leap, and catch her below, or the undertow will drag her under the falling water, and she sinks. Where we wish to run her out a little way from shore, through a channel between rocks, we first throw in little sticks of driftwood, and watch their course, to see where we must steer, so that she will pass the channel in safety. And so we hold, and let go, and pull, and lift, and ward, among rocks, around rocks, and over rocks.

And now we go on through this solemn, mysterious way. The river is very deep, the cañon very narrow, and still obstructed, so that there is no steady flow of the stream; but the waters wheel, and roll, and boil, and we are scarcely able to determine where we can go. Now, the boat is carried to the right, perhaps close to the wall; again, she is shot into the stream, and perhaps is dragged over to the other side, where, caught in a whirlpool, she spins about. We can neither

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land nor run as we please. The boats are entirely unmanageable; no order in their running can be preserved; now one, now another, is ahead, each crew labouring for its own preservation. In such a place we come to another rapid. Two of the boats run it perforce. One succeeds in landing, but there is no foothold by which to make a portage, and she is pushed out again into the stream. The next minute a great reflex wave fills the open compartment; she is water-logged, and drifts unmanageable. Breaker after breaker roll over her, and one capsizes her. The men are thrown out; but they cling to the boat, and she drifts down some distance, alongside of us, and we are able to catch her. She is soon bailed out, and the men are aboard once more; but the oars are lost, so a pair from the *Emma Dean* is spared. Then for two miles we find smooth water.

Clouds are playing in the cañon to-day. Sometimes they roll down in great masses, filling the gorge with gloom; sometimes they hang above, from wall to wall, and cover the cañon with a roof of impending storm; and we can peer long distances up and down this cañon corridor, with its cloud roof overhead, its walls of black granite, and its river bright with the sheen of broken waters. Then, a gust of wind sweeps down a side gulch, and, making a rift in the clouds, reveals the blue heavens, and a stream of sunlight pours in. Then, the clouds drift away into the distance, and hang around crags, and peaks, and pinnacles, and towers, and walls, and cover them with a mantle

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that lifts from time to time, and sets them all in sharp relief. Then, baby clouds creep out of side cañons, glide around points, and creep back again into more distant gorges. Then, clouds, set in strata across the cañon, with intervening vista views, to cliffs and rocks beyond. The clouds are children of the heavens, and when they play among the rocks they lift them to the region above.

It rains! Rapidly little rills are formed above, and these soon grow into brooks, and the brooks grow into creeks, and tumble over the walls in innumerable cascades, adding their wild music to the roar of the river. When the rain ceases, the rills, brooks, and creeks run dry. The waters that fall during a rain on these steep rocks are gathered at once into the river; they could scarcely be poured in more suddenly if some vast spout ran from the clouds to the stream itself. When a storm bursts over the cañon a side gulch is dangerous, for a sudden flood may come, and the inpouring water will raise the river, so as to hide the rocks before your eyes.

Early in the afternoon we discover a stream, entering from the north, a clear, beautiful creek, coming down through a gorgeous red cañon. We land, and camp on a sand beach, above its mouth, under a great, overspreading tree, with willow-shaped leaves.

*August 16.* We must dry our rations again to-day, and make oars.

The Colorado is never a clear stream, but for

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the past three or four days it has been raining much of the time, and the floods, which are poured over the walls, have brought down great quantities of mud, making it exceedingly turbid now. The little affluent, which we have discovered here, is a clear, beautiful creek, or river, as it would be termed in this Western country, where streams are not abundant. We have named one stream, away above, in honour of the great chief of the "Bad Angels," and, as this is in beautiful contrast to that, we conclude to name it "Bright Angel."

Early in the morning, the whole party starts up to explore the Bright Angel River, with the special purpose of seeking timber, from which to make oars. A couple of miles above, we find a large pine log, which has been floated down from the plateau, probably from an altitude of more than 6,000 feet, but not many miles back. On its way, it must have passed over many cataracts and falls, for it bears scars in evidence of the rough usage it has received. The men roll it on skids, and the work of sawing oars is commenced.

This stream heads away back, under a line of abrupt cliffs, that terminates the plateau, and tumbles down more than 4,000 feet in the first mile or two of its course; then runs through a deep, narrow cañon, until it reaches the river.

Late in the afternoon I return, and go up a little gulch, just above this creek, and about two hundred yards from camp, and discover the ruins of two or three old houses, which were originally



Fig. 30.—Mu-av Cañon, a side gorge

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of stone, laid in mortar. Only the foundations are left, but irregular blocks, of which the houses were constructed, lie scattered about. In one room I find an old mealing stone, deeply worn, as if it had been much used. A great deal of pottery is strewn around, and old trails, which in some places are deeply worn into the rocks, are seen.

It is ever a source of wonder to us why these ancient people sought such inaccessible places for their homes. They were, doubtless, an agricultural race, but there are no lands here of any considerable extent that they could have cultivated. To the west of Oraiby, one of the towns in the "Province of Tusayan," in Northern Arizona, the inhabitants have actually built little terraces along the face of the cliff, where a spring gushes out, and thus made their sites for gardens. It is possible that the ancient inhabitants of this place made their agricultural lands in the same way. But why should they seek such spots? Surely, the country was not so crowded with population as to demand the utilization of so barren a region. The only solution of the problem suggested is this: We know that, for a century or two after the settlement of Mexico, many expeditions were sent into the country, now comprised in Arizona and New Mexico, for the purpose of bringing the town-building people under the dominion of the Spanish Government. Many of their villages were destroyed, and the inhabitants fled to regions at that time unknown; and there are traditions among the people who in-

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habit the *pueblos* that still remain that the cañons were these unknown lands. Maybe these buildings were erected at that time; sure it is that they have a much more modern appearance than the ruins scattered over Nevada, Utah, Colorado, Arizona, and New Mexico. Those old Spanish conquerors had a monstrous greed for gold, and a wonderful lust for saving souls. Treasures they must have if not on earth, why, then, in heaven; and when they failed to find heathen temples bedecked with silver, they propitiated Heaven by seizing the heathen themselves. There is yet extant a copy of a record, made by a heathen artist, to express his conception of the demands of the conquerors. In one part of the picture we have a lake, and near by stands a priest pouring water on the head of a native. On the other side, a poor Indian has a cord about his throat. Lines run from these two groups to a central figure, a man with beard and full Spanish panoply. The interpretation of the picture-writing is this: "Be baptized, as this saved heathen; or be hanged, as that damned heathen." Doubtless, some of these people preferred a third alternative, and, rather than be baptized or hanged, they chose to be imprisoned within these cañon walls.

*August 17.* Our rations are still spoiling; the bacon is so badly injured that we are compelled to throw it away. By accident, this morning, the saleratus is lost overboard. We have now only musty flour sufficient for ten days, a few

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dried apples, but plenty of coffee. We must make all haste possible. If we meet with difficulties, as we have done in the cañon above, we may be compelled to give up the expedition, and try to reach the Mormon settlements to the north. Our hopes are that the worst places are passed, but our barometers are all so much injured as to be useless, so we have lost our reckoning in altitude, and know not how much descent the river has yet to make.

The stream is still wild and rapid, and rolls through a narrow channel. We make but slow progress, often landing against a wall, and climbing around some point, where we can see the river below. Although very anxious to advance, we are determined to run with great caution, lest, by another accident, we lose all our supplies. How precious that little flour has become! We divide it among the boats, and carefully store it away, so that it can be lost only by the loss of the boat itself.

We make ten miles and a half, and camp among the rocks on the right. We have had rain, from time to time, all day, and have been thoroughly drenched and chilled; but between showers the sun shines with great power, and the mercury in our thermometers stands at  $115^{\circ}$ , so that we have rapid changes from great extremes, which are very disagreeable. It is especially cold in the rain to-night. The little canvas we have is rotten and useless; the rubber ponchos, with which we started from Green River City, have all been lost;

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more than half the party is without hats, and not one of us has an entire suit of clothes, and we have not a blanket apiece. So we gather driftwood, and build a fire; but after supper the rain, coming down in torrents, extinguishes it, and we sit up all night on the rocks, shivering, and are more exhausted by the night's discomfort than by the day's toil.

*August 18.* The day is employed in making portages, and we advance but two miles on our journey. Still it rains.

While the men are at work making portages, I climb up the granite to its summit, and go away back over the rust-coloured sandstones and greenish-yellow shales to the foot of the marble wall. I climb so high that the men and boats are lost in the black depths below, and the dashing river is a rippling brook; and still there is more cañon above than below. All about me are interesting geological records. The book is open, and I can read as I run. All about me are grand views, for the clouds are playing again in the gorges. But somehow I think of the nine days' rations, and the bad river, and the lesson of the rocks, and the glory of the scene is but half seen.

I push on to an angle, where I hope to get a view of the country beyond, to see, if possible, what the prospect may be of our soon running through this plateau, or, at least, of meeting with some geological change that will let us out of the granite; but, arriving at the point, I can see below only a labyrinth of deep gorges.

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*August 19.* Rain again this morning. Still we are in our granite prison, and the time is occupied until noon in making a long, bad portage.

After dinner, in running a rapid, the pioneer boat is upset by a wave. We are some distance in advance of the larger boats, the river is rough and swift, and we are unable to land, but cling to the boat, and are carried down stream over another rapid. The men in the boats above see our trouble, but they are caught in whirlpools, and are spinning about in eddies, and it seems a long time before they come to our relief. At last they do come; our boat is turned right side up, bailed out; the oars, which fortunately have floated along in company with us, are gathered up, and on we go, without even landing.

Soon after the accident the clouds break away, and we have sunshine again.

Soon we find a little beach, with just room enough to land. Here we camp, but there is no wood. Across the river, and a little way above, we see some driftwood lodged in the rocks. So we bring two boatloads over, build a huge fire, and spread everything to dry. It is the first cheerful night we have had for a week; a warm, drying fire in the midst of the camp and a few bright stars in our patch of heavens overhead.

*August 20.* The characteristics of the cañon change this morning. The river is broader, the walls more sloping, and composed of black slates, that stand on edge. These nearly vertical slates are washed out in places—that is, the softer

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beds are washed out between the harder, which are left standing. In this way curious little alcoves are formed, in which are quiet bays of water, but on a much smaller scale than the great bays and buttresses of Marble Cañon.

The river is still rapid, and we stop to let down with lines several times, but make greater progress as we run ten miles. We camp on the right bank. Here, on a terrace of trap, we discover another group of ruins. There was evidently quite a village on this rock. Again we find mealing stones, and much broken pottery, and up in a little natural shelf in the rock, back of the ruins, we find a globular basket, that would hold perhaps a third of a bushel. It is badly broken, and, as I attempt to take it up, it falls to pieces. There are many beautiful flint-chips, as if this had been the home of an old arrow-maker.

*August 21.* We start early this morning, cheered by the prospect of a fine day, and encouraged, also, by the good run made yesterday. A quarter of a mile below camp the river turns abruptly to the left, and between camp and that point is very swift, running down in a long, broken chute, and piling up against the foot of the cliff, where it turns to the left. We try to pull across, so as to go down on the other side, but the waters are swift, and it seems impossible for us to escape the rock below; but, in pulling across, the bow of the boat is turned to the farther shore, so that we are swept broadside down, and are prevented, by the rebounding waters, from striking

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against the wall. There we toss about for a few seconds in these billows, and are carried past the danger. Below, the river turns again to the right, the cañon is very narrow, and we see in advance but a short distance. The water, too, is very swift, and there is no landing-place. From around this curve there comes a mad roar, and down we are carried, with a dizzying velocity, to the head of another rapid. On either side, high over our heads, there are overhanging granite walls, and the sharp bends cut off our view, so that a few minutes will carry us into unknown waters. Away we go, on one long winding chute. I stand on deck, supporting myself with a strap, fastened on either side to the gunwale, and the boat glides rapidly, where the water is smooth, or, striking a wave, she leaps and bounds like a thing of life, and we have a wild, exhilarating ride for ten miles, which we make in less than an hour. The excitement is so great that we forget the danger, until we hear the roar of a great fall below; then we back on our oars, and are carried slowly towards its head, and succeed in landing just above, and find that we have to make another portage. At this we are engaged until some time after dinner.

Just here we run out of the granite!

Ten miles in less than half a day, and limestone walls below. Good cheer returns; we forget the storms, and the gloom, and cloud-covered cañons, and the black granite, and the raging river, and push our boats from shore in great glee.

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Though we are out of the granite, the river is still swift, and we wheel about a point again to the right, and turn, so as to head back in the direction from which we come, and see the granite again, with its narrow gorge and black crags; but we meet with no more great falls or rapids. Still, we run cautiously, and stop, from time to time, to examine some places which look bad. Yet, we make ten miles this afternoon; twenty miles, in all, to-day.

*August 22* We come to rapids again, this morning, and are occupied several hours in passing them, letting the boats down, from rock to rock, with lines, for nearly half a mile, and then have to make a long portage. While the men are engaged in this, I climb the wall on the northeast, to a height of about 2,500 feet, where I can obtain a good view of a long stretch of cañon below. Its course is to the southwest. The walls seem to rise very abruptly, for 2,500 or 3,000 feet, and then there is a gently sloping terrace, on each side, for two or three miles, and again we find cliffs, 1,500 or 2,000 feet high. From the brink of these the plateau stretches back to the north and south, for a long distance. Away down the cañon, on the right wall, I can see a group of mountains, some of which appear to stand on the brink of the cañon. The effect of the terrace is to give the appearance of a narrow, winding valley, with high walls on either side, and a deep, dark, meandering gorge down its middle. It is impossible, from this point of view, to determine

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whether we have granite at the bottom or not; but, from geological considerations, I conclude that we shall have marble walls below.

After my return to the boats, we run another mile and camp for the night.

We have made but little over seven miles to-day, and a part of our flour has been soaked in the river again.

*August 23.* Our way to-day is again through marble walls. Now and then we pass, for a short distance, through patches of granite, like hills thrust up into the limestone. At one of these places we have to make another portage, and, taking advantage of the delay, I go up a little stream to the north, wading it all the way, sometimes having to take a plunge in to my neck; in other places being compelled to swim across little basins that have been excavated at the foot of the falls. Along its course are many cascades and springs, gushing out from the rocks on either side. Sometimes a cottonwood tree grows over the water. I come to one beautiful fall, of more than a hundred and fifty feet, and climb around it to the right, on the broken rocks. Still going up, I find the cañon narrowing very much, being but fifteen or twenty feet wide; yet the walls rise on either side many hundreds of feet, perhaps thousands; I can hardly tell.

In some places the stream has not excavated its channel down vertically through the rocks, but has cut obliquely, so that one wall overhangs the other. In other places it is cut vertically

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above and obliquely below, or obliquely above and vertically below, so that it is impossible to see out overhead. But I can go no farther. The time which I estimated it would take to make the portage has almost expired, and I start back on a round trot, wading in the creek where I must, and plunging through basins, and find the men waiting for me, and away we go on the river.

Just after dinner we pass a stream on the right, which leaps into the Colorado by a direct fall of more than a hundred feet, forming a beautiful cascade. There is a bed of very hard rock above, thirty or forty feet in thickness, and much softer beds below. The hard beds above project many yards beyond the softer, which are washed out, forming a deep cave behind the fall, and the stream pours through a crevice above into a deep pool below. Around on the rocks, in the cave-like chamber, are set beautiful ferns, with delicate fronds and enamelled stalks. The little frondlets have their points turned down, to form spore cases. It has very much the appearance of the maiden's hair fern, but is much larger. This delicate foliage covers the rocks all about the fountain, and gives the chamber great beauty. But we have little time to spend in admiration, so on we go.

We make fine progress this afternoon, carried along by a swift river, and shoot over the rapids, finding no serious obstructions.

The cañon walls, for 2,500 or 3,000 feet, are very regular, rising almost perpendicularly, but

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here and there set with narrow steps, and occasionally we can see away above the broad terrace, to distant cliffs.

We camp to-night in a marble cave, and find, on looking at our reckoning, we have run twenty-two miles.

*August 24.* The cañon is wider to-day. The walls rise to a vertical height of nearly 3,000 feet. In many places the river runs under a cliff, in great curves, forming amphitheatres, half-dome shaped.

Though the river is rapid, we meet with no serious obstructions, and run twenty miles. It is curious how anxious we are to make up our reckoning every time we stop, now that our diet is confined to plenty of coffee, very little spoiled flour, and very few dried apples. It has come to be a race for a dinner. Still, we make such fine progress, all hands are in good cheer, but not a moment of daylight is lost.

*August 25.* We make twelve miles this morning, when we come to monuments of lava, standing in the river; low rocks mostly, but some of them shafts more than a hundred feet high. Going on down, three or four miles, we find them increasing in number. Great quantities of cooled lava and many cinder cones are seen on either side; and then we come to an abrupt cataract. Just over the fall, on the right wall, a cinder cone, or extinct volcano, with a well-defined crater, stands on the very brink of the cañon. This, doubtless, is the one we saw two or three

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days ago. From this volcano vast floods of lava have been poured into the river, and a stream of the molten rock has run up the cañon, three or four miles, and down, we know not how far. Just where it poured over the cañon wall is the fall. The whole north side, as far as we can see, is lined with the black basalt, and high up on the opposite wall are patches of the same material, resting on the benches, and filling old alcoves and caves, giving to the wall a spotted appearance.

The rocks are broken in two, along a line which here crosses the river, and the beds, which we have seen coming down the cañon for the last thirty miles, have dropped eight hundred feet, on the lower side of the line, forming what geologists call a fault. The volcanic cone stands directly over the fissure thus formed. On the side of the river opposite, mammoth springs burst out of this crevice, one or two hundred feet above the river, pouring in a stream quite equal in volume to the Colorado Chiquito.

This stream seems to be loaded with carbonate of lime, and the water, evaporating, leaves an incrustation on the rocks; and this process has been continued for a long time, for extensive deposits are noticed, in which are basins, with bubbling springs. The water is salty.

We have to make a portage here, which is completed in about three hours, and on we go.

We have no difficulty as we float along, and I am able to observe the wonderful phenomena connected with this flood of lava. The cañon was

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doubtless filled to a height of twelve or fifteen hundred feet, perhaps by more than one flood. This would dam the water back; and in cutting through this great lava bed, a new channel has been formed, sometimes on one side, sometimes on the other. The cooled lava, being of firmer texture than the rocks of which the walls are composed, remains in some places; in others a narrow channel has been cut, leaving a line of basalt on either side. It is possible that the lava cooled faster on the sides against the walls, and that the centre ran out; but of this we can only conjecture. There are other places, where almost the whole of the lava is gone, patches of it only being seen where it has caught on the walls. As we float down, we can see that it ran out into side cañons. In some places this basalt has a fine, columnar structure, often in concentric prisms, and masses of these concentric columns have coalesced. In some places, where the flow occurred, the cañon was probably at about the same depth as it is now, for we can see where the basalt has rolled out on the sands, and, what seems curious to me, the sands are not melted or metamorphosed to any appreciable extent. In places the bed of the river is of sandstone or limestone, in other places of lava, showing that it has all been cut out again where the sandstones and limestones appear; but there is a little yet left where the bed is of lava.

What a conflict of water and fire there must have been here! Just imagine a river of molten

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rock, running down into a river of melted snow. What a seething and boiling of the waters; what clouds of steam rolled into the heavens!

Thirty-five miles to-day. Hurrah!

*August 26.* The cañon walls are steadily becoming higher as we advance. They are still bold, and nearly vertical up to the terrace. We still see evidence of the eruption discovered yesterday, but the thickness of the basalt is decreasing, as we go down the stream; yet it has been reinforced at points by streams that have come from volcanoes standing on the terrace above, but which we cannot see from the river below.

Since we left the Colorado Chiquito, we have seen no evidences that the tribe of Indians inhabiting the plateaus on either side ever come down to the river; but about eleven o'clock to-day we discover an Indian garden, at the foot of the wall on the right, just where a little stream, with a narrow flood plain, comes down through a side cañon. Along the valley, the Indians have planted corn, using the water which burst out in springs at the foot of the cliff for irrigation. The corn is looking quite well, but is not sufficiently advanced to give us roasting ears; but there are some nice green squashes. We carry ten or a dozen of these on board our boats, and hurriedly leave, not willing to be caught in the robbery, yet excusing ourselves by pleading our great want. We run down a short distance to where we feel certain no Indians can follow; and what a kettle of squash sauce we make! True, we have no

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salt with which to season it, but it makes a fine addition to our unleavened bread and coffee. Never was fruit so sweet as those stolen squashes. After dinner we push on again, making fine time, finding many rapids, but none so bad that we cannot run them with safety, and when we stop, just at dusk, and foot up our reckoning, we find that we have run thirty-five miles again.

What a supper we make; unleavened bread, green squash sauce, and strong coffee. We have been for a few days on half-rations, but we have no stint of roast squash.

A few days like this, and we are out of prison.

*August 27.* This morning the river takes a more southerly direction. The dip of the rocks is to the north, and we are rapidly running into lower formations. Unless our course changes, we shall very soon run again into the granite. This gives us some anxiety. Now and then the river turns to the west, and excites hopes that are soon destroyed by another turn to the south. About nine o'clock we come to the dreaded rock. It is with no little misgiving that we see the river enter those black, hard walls. At its very entrance we have to make a portage; then we have to let down with lines past some ugly rocks. Then we run a mile or two farther, and then the rapids below can be seen.

About eleven o'clock we come to a place where it seems much worse than any we have yet met in all its course. A little creek comes down from the left. We land first on the right, and

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clamber up over the granite pinnacles for a mile or two, but can see no way by which we can let down, and to run it would be sure destruction. After dinner we cross to examine it on the left. High above the river we can walk along on the top of the granite, which is broken off at the edge, and set with crags and pinnacles, so that it is very difficult to get a view of the river at all. In my eagerness to reach a point where I can see the roaring fall below, I go too far on the wall, and can neither advance nor retreat. I stand with one foot on a little projecting rock, and cling with my hand fixed in a little crevice. Finding I am caught here, suspended four hundred feet above the river, into which I should fall if my footing fails, I call for help. The men come, and pass me a line, but I cannot let go of the rock long enough to take hold of it. Then they bring two or three of the largest oars. All this takes time which seems very precious to me; but at last they arrive. The blade of one of the oars is pushed into a little crevice in the rock beyond me, in such a manner that they can hold me pressed against the wall. Then another is fixed in such a way that I can step on it, and thus I am extricated.

Still another hour is spent in examining the river from this side, but no good view of it is obtained, so now we return to the side that was first examined, and the afternoon is spent in clambering among the crags and pinnacles, and carefully scanning the river again. We find that

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the lateral streams have washed boulders into the river, so as to form a dam over which the water makes a broken fall of eighteen or twenty feet; then there is a rapid, beset with rocks, for two or three hundred yards, while, on the other side, points of the wall project into the river. Then there is a second fall below; how great, we cannot tell. Then there is a rapid, filled with huge rocks, for one or two hundred yards. At the bottom of it, from the right wall, a great rock projects quite half-way across the river. It has a sloping surface extending upstream, and the water, coming down with all the momentum gained in the falls and rapids above, rolls up this inclined plane many feet and tumbles over to the left. I decide that it is possible to let down over the first fall, then run near the right cliff to a point just above the second, where we can pull out into a little chute, and, having run over that in safety, we must pull with all our power across the stream, to avoid the great rock below. On my return to the boat, I announce to the men that we are to run it in the morning. Then we cross the river, and go down into camp for the night on some rocks, in the mouth of the little side cañon.

After supper Captain Howland asks to have a talk with me. We walk up the little creek a short distance, and I soon find that his object is to remonstrate against my determination to proceed. He thinks that we had better abandon the river here. Talking with him, I learn that his brother, William Dunn, and himself have deter-

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mined to go no farther in the boats. So we return to camp. Nothing is said to the other men.

For the last two days our course has not been plotted. I sit down and do this now, for the purpose of finding where we are by dead reckoning. It is a clear night, and I take out the sextant to make observations for latitude, and find that the astronomic determination agrees very nearly with that of the plot—quite as closely as might be expected, from a meridian observation on a planet. In a direct line, we must be about forty-five miles from the mouth of the Rio Virgen. If we can reach that point, we know that there are settlements up that river about twenty miles. This forty-five miles, in a direct line, will probably be eighty or ninety in the meandering line of the river. But then we know that there is comparatively open country for many miles about the mouth of the Virgen, which is our point of destination.

As soon as I determine all this, I spread my plot on the sand, and wake Howland, who is sleeping down by the river, and show him where I suppose we are, and where several Mormon settlements are situated.

We have another short talk about the morrow, and he lies down again; but for me there is no sleep. All night long I pace up and down a little path, on a few yards of sand beach, along by the river. Is it wise to go on? I go to the boats again, to look at our rations. I feel satisfied

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that we can get over the danger immediately before us; what there may be below I know not. From our outlook yesterday, on the cliffs, the cañon seemed to make another great bend to the south, and this, from our experience heretofore, means more and higher granite walls. I am not sure that we can climb out of the cañon here, and, when at the top of the wall, I know enough of the country to be certain that it is a desert of rock and sand, between this and the nearest Mormon town, which, on the most direct line, must be seventy-five miles away. True, the late rains have been favourable to us, should we go out, for the probabilities are that we shall find water still standing in holes, and, at one time, I almost conclude to leave the river. But for years I have been contemplating this trip. To leave the exploration unfinished, to say that there is a part of the cañon which I cannot explore, having already almost accomplished it, is more than I am willing to acknowledge, and I determine to go on.

I wake my brother and tell him of Howland's determination, and he promises to stay with me; then I call up Hawkins, the cook, and he makes a like promise; then Sumner, and Bradley, and Hall, and they all agree to go on.

*August 28.* At last daybreak comes, and we have breakfast, without a word being said about the future. The meal is as solemn as a funeral. After breakfast I ask the three men if they still think it best to leave us. The elder Howland thinks it is, and Dunn agrees with him. The

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younger Howland tries to persuade them to go on with the party, failing in which, he decides to go with his brother.

Then we cross the river. The small boat is very much disabled, and unseaworthy. With the loss of hands, consequent on the departure of the three men, we shall not be able to run all of the boats, so I decide to leave my *Emma Dean*.

Two rifles and a shotgun are given to the men who are going out. I ask them to help themselves to the rations, and take what they think to be a fair share. This they refuse to do, saying they have no fear but what they can get something to eat; but Billy, the cook, has a pan of biscuits prepared for dinner, and these he leaves on a rock.

Before starting, we take our barometers, fossils, the minerals, and some ammunition from the boat and leave them on the rocks. We are going over this place as light as possible. The three men help us lift our boats over a rock twenty-five or thirty feet high, and let them down again over the first fall, and now we are all ready to start.

The last thing before leaving, I write a letter to my wife, and give it to Howland. Sumner gives him his watch, directing that it be sent to his sister, should he not be heard from again. The records of the expedition have been kept in duplicate. One set of these is given to Howland, and now we are ready. For the last

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time, they entreat us not to go on, and tell us that it is madness to set out in this place; that we can never get safely through it; and, further, that the river turns again to the south into the granite, and a few miles of such rapids and falls will exhaust our entire stock of rations, and then it will be too late to climb out. Some tears are shed; it is a rather solemn parting; each party thinks the other is taking the dangerous course.

My old boat left, I go on board of the *Maid of the Canon*. The three men climb a crag, that overhangs the river, to watch us off. The *Maid of the Canon* pushes out. We glide rapidly along the foot of the wall, just grazing one great rock, then pull out a little into the chute of the second fall, and plunge over it. The open compartment is filled when we strike the first wave below, but we cut through it, and then the men pull with all their power toward the left wall, and swing clear of the dangerous rock below all right. We are scarcely a minute in running it, and find that, although it looked bad from above, we have passed many places that were worse.

The other boat follows with more difficulty. We land at the first practicable point below and fire our guns as a signal to the men above that we have come over in safety. Here we remain a couple of hours, hoping that they will take the smaller boat and follow us. We are behind a curve in the cañon, and cannot see up to where we left them, and so we wait until their coming seems hopeless, and push on.

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And now we have a succession of rapids and falls until noon, all of which we run in safety. Just after dinner we come to another bad place. A little stream comes in from the left, and below there is a fall, and still below another fall. Above, the river tumbles down, over and among the rocks, in whirlpools and great waves, and the waters are lashed into mad, white foam. We run along the left, above this, and soon see that we cannot get down on this side, but it seems possible to let down on the other. We pull up stream again for two or three hundred yards and cross. Now there is a bed of basalt on this northern side of the cañon with a bold escarpment, that seems to be a hundred feet high. We can climb it, and walk along its summit to a point where we are just at the head of the fall. Here the basalt is broken down again, so it seems to us, and I direct the men to take a line to the top of the cliff, and let the boats down along the wall. One man remains in the boat, to keep her clear of the rocks, and prevent her line from being caught on the projecting angles. I climb the cliff, and pass along to a point just over the fall, and descend by broken rocks, and find that the break of the fall is above the break of the wall, so that we cannot land; and that still below the river is very bad, and that there is no possibility of a portage. Without waiting further to examine and determine what shall be done, I hasten back to the top of the cliff, to stop the boats from coming down. When I arrive I find the men have let

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one of them down to the head of the fall. She is in swift water, and they are not able to pull her back; nor are they able to go on with the line, as it is not long enough to reach the higher part of the cliff, which is just before them; so they take a bight around a crag. I send two men back for the other line. The boat is in very swift water, and Bradley is standing in the open compartment, holding out his oar to prevent her from striking against the foot of the cliff. Now she shoots out into the stream, and up as far as the line will permit, and then, wheeling, drives headlong against the rock, then out and back again, now straining on the line, now striking against the rock. As soon as the second line is brought, we pass it down to him; but his attention is all taken up with his own situation, and he does not see that we are passing the line to him. I stand on a projecting rock, waving my hat to gain his attention, for my voice is drowned by the roaring of the falls. Just at this moment, I see him take his knife from its sheath, and step forward to cut the line. He has evidently decided that it is better to go over with the boat as it is, than to wait for her to be broken to pieces. As he leans over, the boat sheers again into the stream, the stem-post breaks away, and she is loose. With perfect composure Bradley seizes the great scull oar, places it in the stern rowlock, and pulls with all his power (and he is an athlete) to turn the bow of the boat downstream, for he wishes to go bow down, rather than to drift broadside on.

## The Grand Cañon of the Colorado

One, two strokes he makes, and a third just as she goes over, and the boat is fairly turned, and she goes down almost beyond our sight, though we are more than a hundred feet above the river. Then she comes up again, on a great wave, and down and up, then around behind some great rocks, and is lost in the mad, white foam below. We stand frozen with fear, for we see no boat. Bradley is gone, so it seems. But now, away below, we see something coming out of the waves. It is evidently a boat. A moment more, and we see Bradley standing on deck, swinging his hat to show that he is all right. But he is in a whirlpool. We have the stem post of his boat attached to the line. How badly she may be disabled we know not. I direct Sumner and Powell to pass along the cliff, and see if they can reach him from below. Rhodes, Hall, and myself run to the other boat, jump aboard, push out, and away we go over the falls. A wave rolls over us, and our boat is unmanageable. Another great wave strikes us, the boat rolls over, and tumbles and tosses, I know not how. All I know is that Bradley is picking us up. We soon have all right again, and row to the cliff, and wait until Sumner and Powell can come. After a difficult climb they reach us. We run two or three miles farther, and turn again to the northwest, continuing until night, when we have run out of the granite once more.

*August 29.* We start very early this morning.

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The river still continues swift, but we have no serious difficulty, and at twelve o'clock emerge from the Grand Cañon of the Colorado.

We are in a valley now, and low mountains are seen in the distance, coming to the river below. We recognize this as the Grand Wash.

A few years ago a party of Mormons set out from St. George, Utah, taking with them a boat, and came down to the mouth of the Grand Wash, where they divided, a portion of the party crossing the river to explore the San Francisco Mountains. Three men—Hamblin, Miller, and Crosby—taking the boat, went on down the river to Callville, landing a few miles below the mouth of the Rio Virgen. We have their manuscript journal with us, and so the stream is comparatively well known.

To-night we camp on the left bank in a mesquit thicket

The relief from danger and the joy of success are great. When he who has been chained by wounds to a hospital cot, until his canvas tent seems like a dungeon cell, until the groans of those who lie about, tortured with probe and knife, are piled up, a weight of horror on his ears that he cannot throw off, cannot forget, and until the stench of festering wounds and anæsthetic drugs has filled the air with its loathsome burthen, at last goes into the open field, what a world he sees! How beautiful the sky; how bright the sunshine; what "floods of delirious music" pour from the throats of birds; how

## The Grand Cañon of the Colorado

sweet the fragrance of earth and tree, and blossom! The first hour of convalescent freedom seems rich recompense for all—pain, gloom, terror.

Something like this are the feelings we experience to-night. Ever before us has been an unknown danger, heavier than immediate peril. Every waking hour passed in the Grand Cañon has been one of toil. We have watched with deep solicitude the steady disappearance of our scant supply of rations, and from time to time have seen the river snatch a portion of the little left, while we were ahungered. And danger and toil were endured in those gloomy depths, where oftentimes the clouds hid the sky by day, and but a narrow zone of stars could be seen at night. Only during the few hours of deep sleep, consequent on hard labour, has the roar of the waters been hushed. Now the danger is over; now the toil has ceased; now the gloom has disappeared; now the firmament is bounded only by the horizon; and what a vast expanse of constellations can be seen!

The river rolls by us in silent majesty; the quiet of the camp is sweet; our joy is almost ecstasy. We sit till long after midnight, talking of the Grand Cañon, talking of home, but chiefly talking of the three men who left us. Are they wandering in those depths, unable to find a way out? are they searching over the desert lands above for water? or are they nearing the settlements?

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*August 30.* We run two or three short, low cañons to-day, and on emerging from one, we discover a band of Indians in the valley below. They see us, and scamper away in most eager haste, to hide among the rocks. Although we land, and call for them to return, not an Indian can be seen.

Two or three miles farther down, in turning a short bend in the river, we come upon another camp. So near are we before they can see us that I can shout to them, and, being able to speak a little of their language, I tell them we are friends; but they flee to the rocks, except a man, a woman, and two children. We land, and talk with them. They are without lodges, but have built little shelters of boughs, under which they wallow in the sand. The man is dressed in a hat; the woman in a string of beads only. At first they are evidently much terrified; but when I talk to them in their own language, and tell them we are friends, and inquire after people in the Mormon towns, they are soon reassured, and beg for tobacco. Of this precious article we have none to spare. Sumner looks around in the boat for something to give them, and finds a little piece of coloured soap, which they receive as a valuable present, rather as a thing of beauty than as a useful commodity, however. They are either unwilling or unable to tell us anything about the Indians or white people, and so we push off, for we must lose no time.

We camp at noon under the right bank. And

## The Grand Cañon of the Colorado

now, as we push out, we are in great expectancy, for we hope every minute to discover the mouth of the Rio Virgen.

Soon one of the men exclaims: "Yonder's an Indian in the river." Looking for a few minutes, we certainly do see two or three persons. The men bend to their oars, and pull toward them. Approaching, we see that there are three white men and an Indian hauling a seine, and then we discover that it is just at the mouth of the long-sought river.

As we come near, the men seem far less surprised to see us than we do to see them. They evidently know who we are, and, on talking with them, they tell us that we have been reported lost long ago, and that some weeks before, a messenger had been sent from Salt Lake City, with instructions for them to watch for any fragments or relics of our party that might drift down the stream.

Our new-found friends, Mr. Asa and his two sons, tell us that they are pioneers of a town that is to be built on the bank.

Eighteen or twenty miles up the valley of the Rio Virgen there are two Mormon towns, St. Joseph and St. Thomas. To-night we despatch an Indian to the last mentioned place, to bring any letters that may be there for us.

Our arrival here is very opportune. When we look over our store of supplies, we find about ten pounds of flour, fifteen pounds of dried apples, but seventy or eighty pounds of coffee.





